THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. XCII. No. 2216.] LONDON, OCTOBER 31, 1905. [57TH YEAR. PRICE 6d.

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PATENT ANTIMONY PAINT & PARKER'S IMPERIAL BLACK VARNISH.

OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

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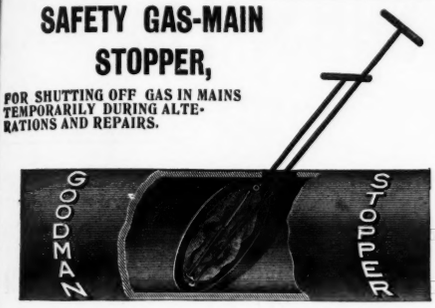
FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.



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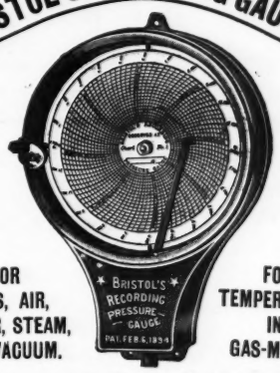

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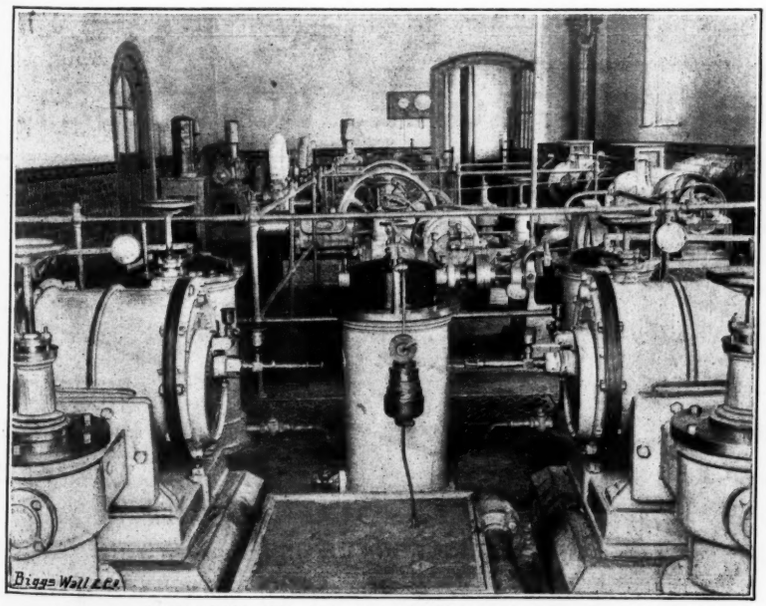

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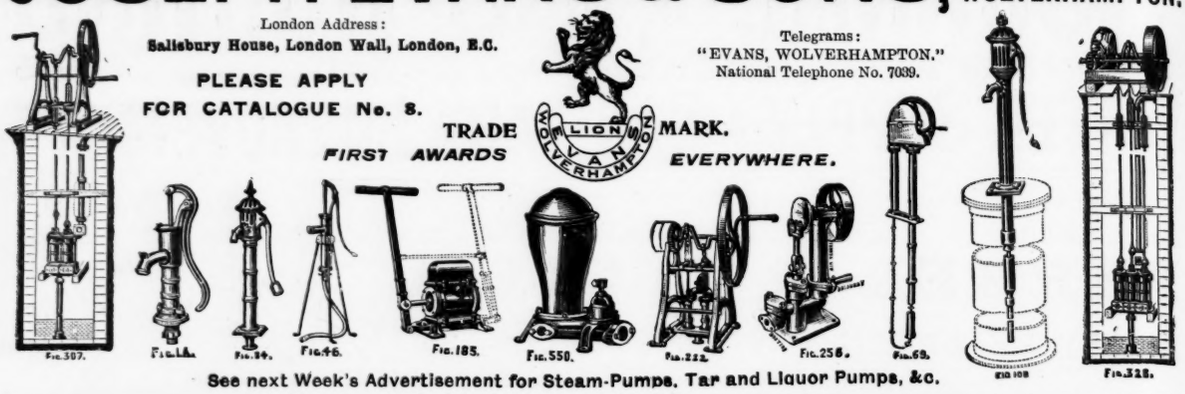

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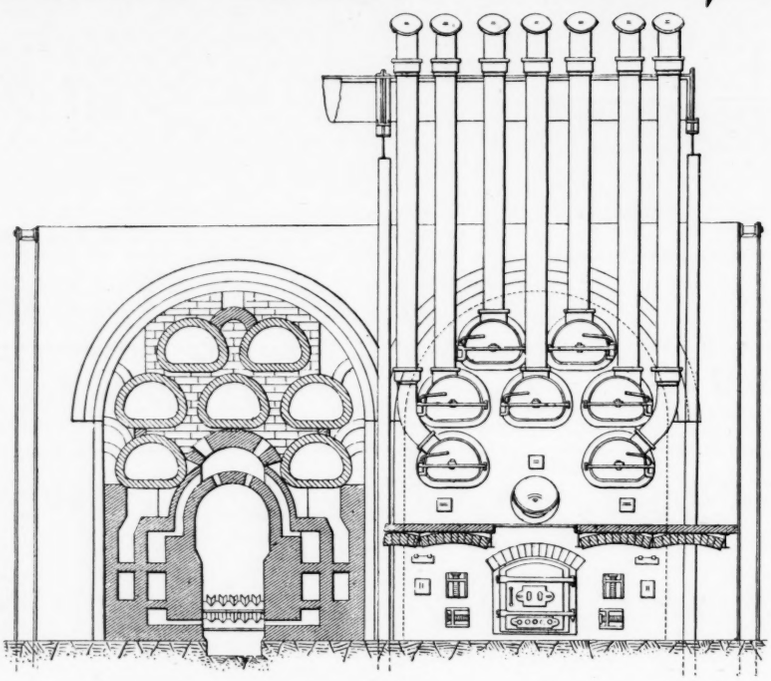

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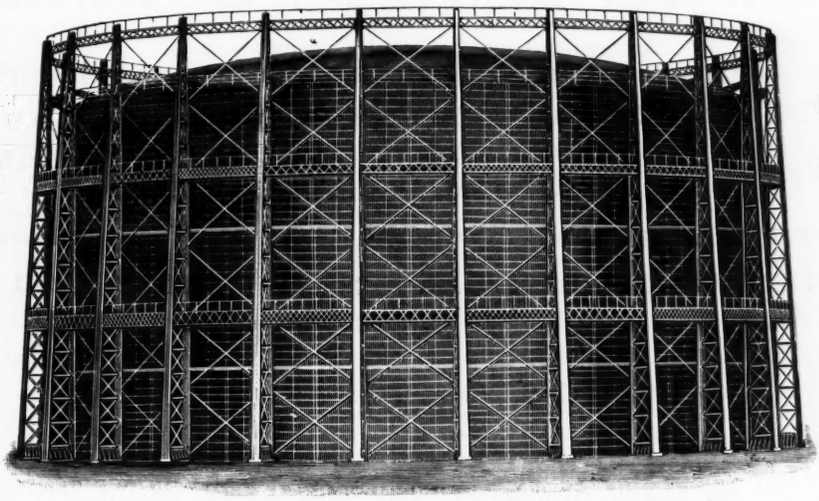

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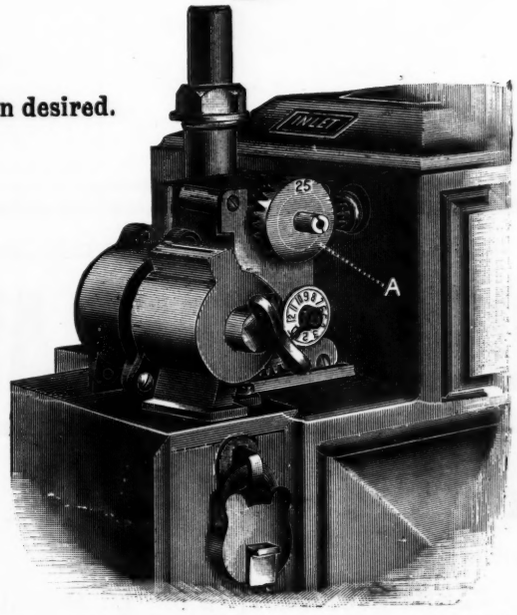

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Specialities:
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Spur & Bevel Wheels,
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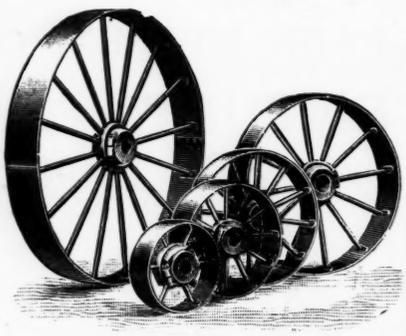

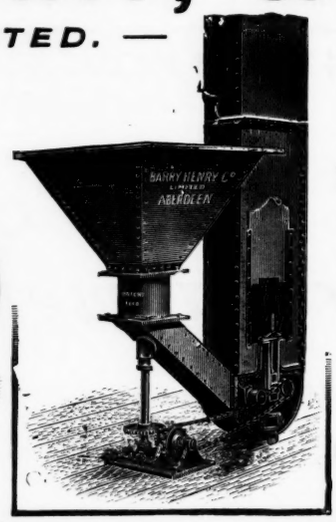

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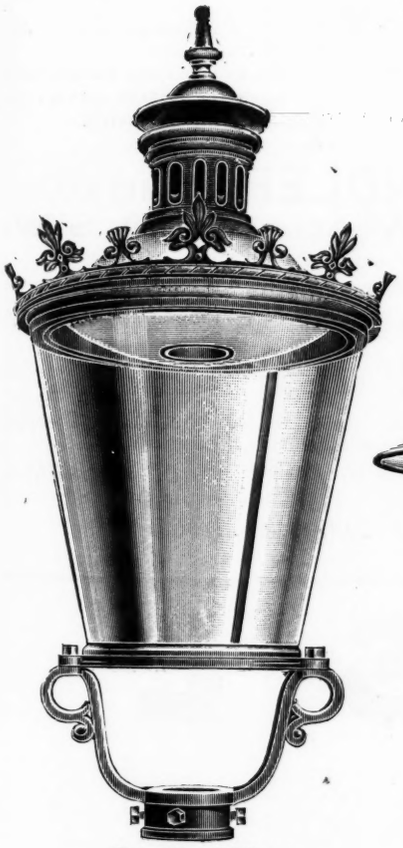

Fig. 35. 100 c.p.

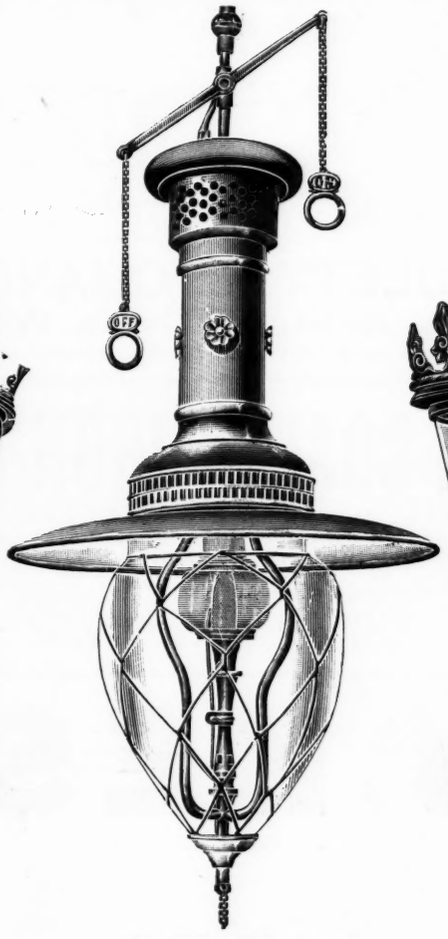

Fig. 607. 600 c.p.
Self-Intensifying.

Fig. 35a. 300 c.p.
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Thousands of the above Lamps in use and giving satisfaction.

EACH LAMP AND MANTLE GUARANTEED.

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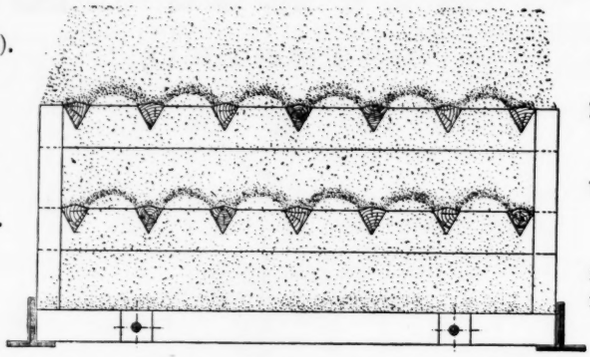
* Number of Purifiers.



Lightening of Material due to natural arches formed (as illustrated) preventing consolidation.

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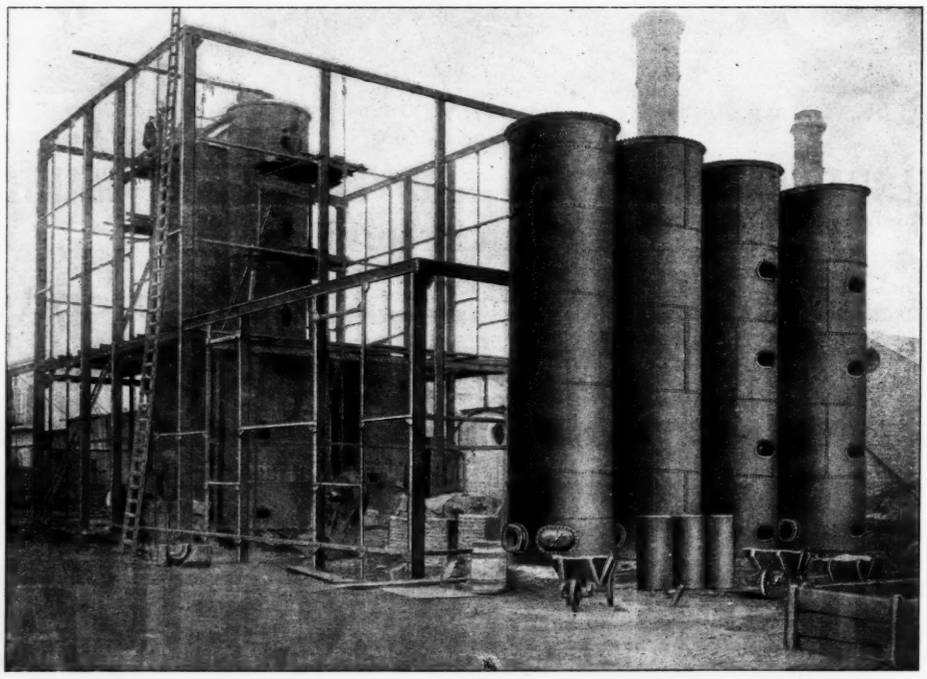

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For Incandescent Street Lighting.

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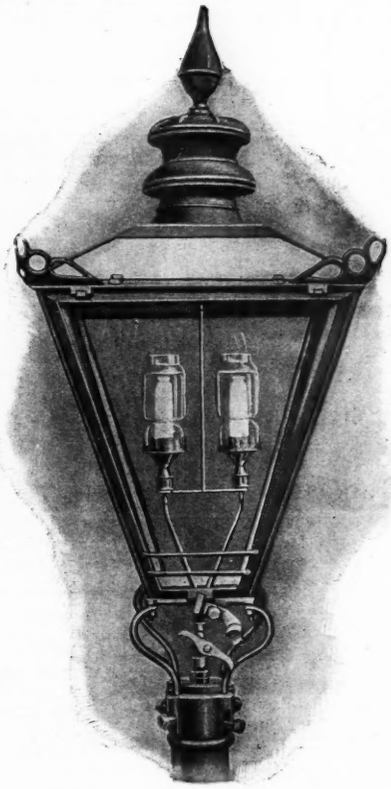

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These Lanterns are in use in large numbers for Street Lighting in many of the principal Cities in the United Kingdom.

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The "OMEGA" Window Drier.

For the PREVENTION OF STEAMY WINDOWS.

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Will not Ignite Linen or Paper even when in contact.

A BOON TO SHOPKEEPERS
For Keeping their Windows Warm and Dry.

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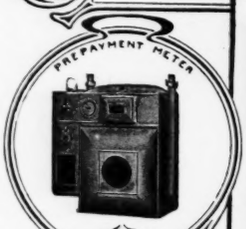
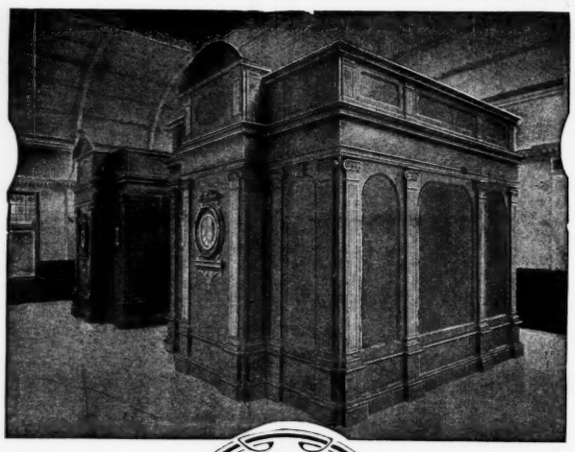
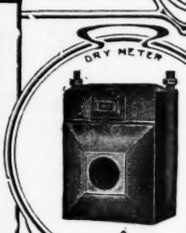
GAS & WATER ENGINEERS,







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RADIATE MORE HEAT

BY USING

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SILICA BRICKS for Combustion Chambers, any shape.

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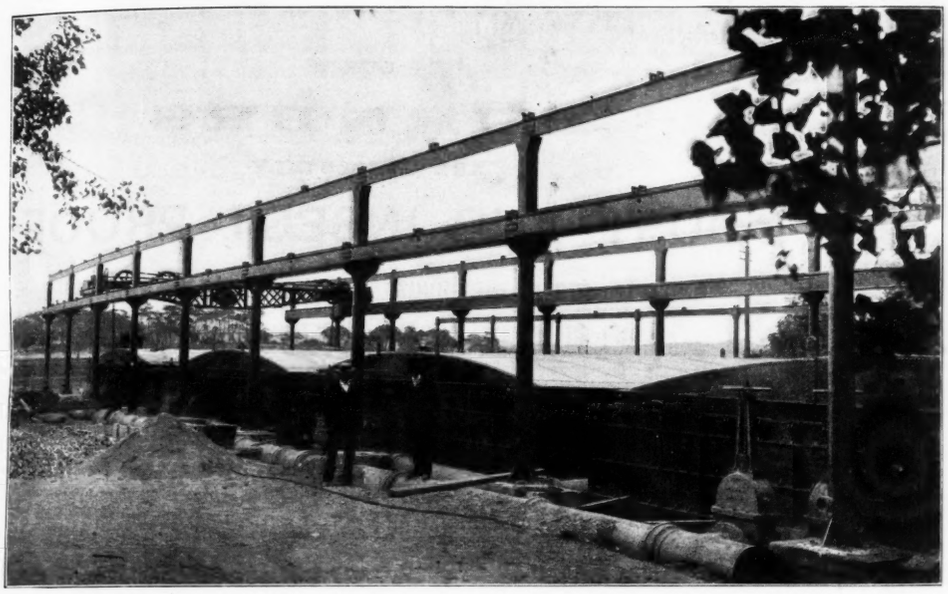

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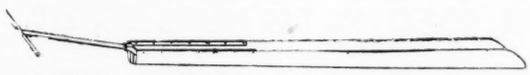

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Horizontal or Inclined; also Makers of Segmental Retorts of all Sections.

PATENTEES OF
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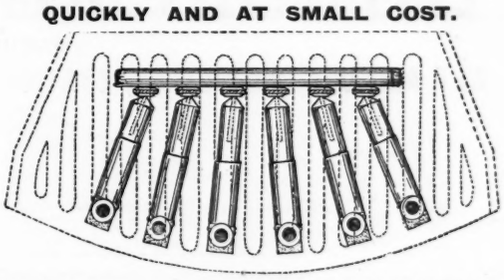
QUICKLY AND AT SMALL COST.



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Can be Adjusted to Shape of Grate and Gas Pressure *in situ*.

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PATENT HIGH-POWER LAMP

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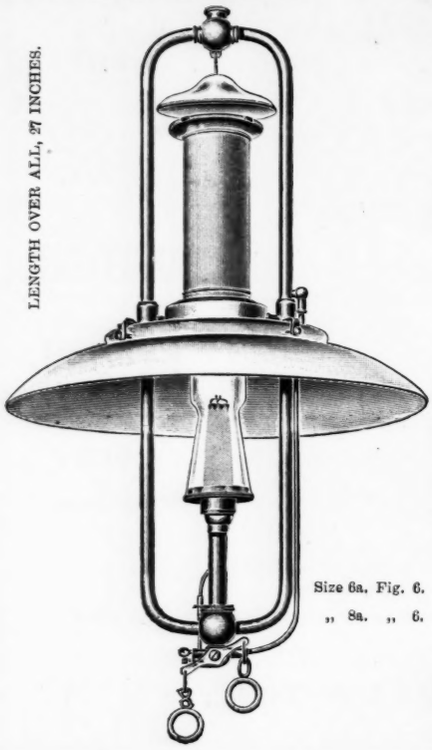

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Size 6a. Fig. 6.
„ 8a. „ 6.

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SQUARE STATION METERS WITH PLANED JOINTS.

STATION METERS IN CYLINDRICAL CASES.

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Have undoubtedly caught on through sheer merit. They have points which other fires have not.

It is true that

DIAMOND BURNERS

Are new in Design.
Are quiet in Action.
Will not Light Back.
Give perfect Combustion.

It is true that

DIAMOND PRICES

Are low—very low. They range from **12***s.* **6***d. upwards through the series of Six Fires.*

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THE CHEERY GLOW.

The Sole Cause—

TRIDENT FIRES.

And we are

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Barrow	300,000	G. L. & C. Co., Fulham	1,750,000	Romford	300,000
Bath	1,000,000	G. L. & C. Co., Nine Elms	2,750,000	Rotterdam, Holland	850,000
Belfast	1,700,000	Geneva, Switz.	500,000	Rotterdam, Holland (Second)	1,500,000
Belfast (Second)	4,500,000	Gosport	200,000	Rotterdam, Holland (Third)	750,000
Birmingham	1,500,000	Göteborg, Sweden	300,000	St. Gallen, Switz.	225,000
Bordentown, N.J.	125,000	Guildford	350,000	St. Joseph, Mo.	750,000
Bournemouth	1,000,000	Hamburg, Germany	1,750,000	Santiago de Cuba	400,000
Bremen, Germany	550,000	Hartlepool	750,000	Scarborough	800,000
Bremen, Germany (Second)	950,000	Hebden Bridge	200,000	Shanghai	225,000
Brentford	1,200,000	Heidelberg, Germany	200,000	Shanghai (Second)	225,000
Bridlington	150,000	Holyoke, Mass.	600,000	Southampton	800,000
Bridlington (Second)	200,000	Hull	1,500,000	Southampton (Second)	500,000
Brighton	1,750,000	L. & N.W. Rly., Crewe	700,000	Southgate	400,000
Brighton (Second)	1,850,000	Lawrence, Mass.	400,000	Southport	750,000
Brussels—Forest	1,000,000	Lea Bridge	350,000	Southport (Second)	900,000
Brussels—Ville	750,000	Lea Bridge (Second)	350,000	Stafford	500,000
Brussels—Ville (Second)	750,000	Liége, Belgium	1,000,000	Staines	600,000
Brussels—Ville (Third)	1,500,000	Lincoln	500,000	Stockport	600,000
Carlisle	600,000	Liverpool	3,500,000	Stockport (Second)	600,000
Chorley	300,000	Liverpool (Second)	4,500,000	Stockton-on-Tees	500,000
Commercial Gas Co.	850,000	Longton	600,000	Swansea	750,000
Commercial (Second)	850,000	Madgeburg, Germany	1,400,000	Swansea (Second)	1,000,000
Commercial (Third)	1,250,000	Maidenhead	225,000	Sydney—Harbour	500,000
Commercial (Fourth)	2,000,000	Maidenhead (Second)	225,000	Sydney—Harbour (Second)	500,000
Copenhagen	700,000	Malta	400,000	Sydney—Mortlake	500,000
Copenhagen (Second)	2,500,000	Manchester	3,500,000	Sydney—Mortlake (Second)	500,000
Coventry	600,000	Manchester (Second)	3,500,000	Syracuse, N.Y.	850,000
Coventry (Second)	600,000	McKeesport, Pa.	500,000	Taunton	225,000
Croydon	1,250,000	Merthyr Tydfil	300,000	The Hague, Holland	1,000,000
Croydon (Second)	625,000	Middlesbrough	1,250,000	Tilburg, Holland	400,000
Croydon (Third)	625,000	Newburgh, N.Y.	350,000	Tottenham	750,000
Deventer, Holland	150,000	Newburgh (Second)	250,000	Tottenham (Second)	750,000
Deventer, Holland (Second)	200,000	New York	1,200,000	Tottenham (Third)	350,000
Dorking	150,000	New York	4,000,000	Tottenham (Fourth)	1,000,000
Dublin	2,000,000	North Middlesex	150,000	Tunbridge Wells	1,000,000
Dublin (Second)	2,000,000	North Middlesex (Second)	200,000	Utrecht, Holland	1,000,000
Dunedin, N.Z.	150,000	Norwich	1,000,000	Utrecht, Holland (Second)	1,000,000
Durham	200,000	Ostend, Belgium	100,000	Waltham	400,000
Eastbourne	1,250,000	Perth, W.A.	125,000	Wandsworth & Putney	1,800,000
Edinburgh	2,000,000	Port Elizabeth, S.A.	400,000	Watford	300,000
Epsom	225,000	Portsmouth	1,000,000	Watford (Second)	350,000
Falmouth	150,000	Posen, Germany	450,000	West Ham	1,500,000
Faversham	200,000	Posen, Germany (Second)	700,000	Winchester	225,000
		Preston	1,400,000	Zwolle, Holland	200,000

WORK UNDERTAKEN DURING THIS SEASON AND LAST.

Dunedin, N.Z. (2nd)	275,000	Bridgwater	200,000	Zwolle, Holland (2nd)	200,000
Taunton (2nd)	350,000	West Ham (2nd)	800,000	Alkmaar, Holland	400,000
Bognor	100,000	Brieg, Silesia	100,000	Leiden, Holland	500,000
Bournemouth (2nd)	500,000	Brussels—Ville (4th)	350,000	Poole	1,500,000
Vienna	3,500,000	Innsbruck, Austria	200,000	Berlin-Rixdorf	650,000
Maastricht, Holland	200,000	Marlborough	100,000	Berlin-Charlottenburg	2,500,000
Antwerp, Belgium (2nd)	1,000,000	Flensburg, Sleswig	300,000	Bochum, Westphalia	530,000
Tottenham (5th)	1,000,000	Weston-super-Mare	300,000	Brussels–Anderlecht	350,000
The Hague, Holland (2nd)	500,000	Wexford, Ireland	100,000	Leigh, Lancs.	350,000
Hampton Court	500,000	Budapest, Hungary	50,000	Stockport (3rd)	400,000
Lea Bridge (3rd)	400,000	Swindon	300,000	Agram, Croatia.	200,000
Dublin (3rd)	650,000	Reading	1,000,000	Bruges, Belgium	200,000
North Middlesex (3rd)	75,000	Oberhausen, Germany	175,000	Liége, Belgium (2nd)	750,000
St. Gallen, Switz. (2nd)	225,000	Malmö, Sweden	350,000	Lemberg, Galicia	260,000
Brussels—St. Josse	1,000,000	Ipswich	750,000	Leeuwarden, Holland	400,000
Dundee	1,500,000	Winchester (2nd)	125,000		

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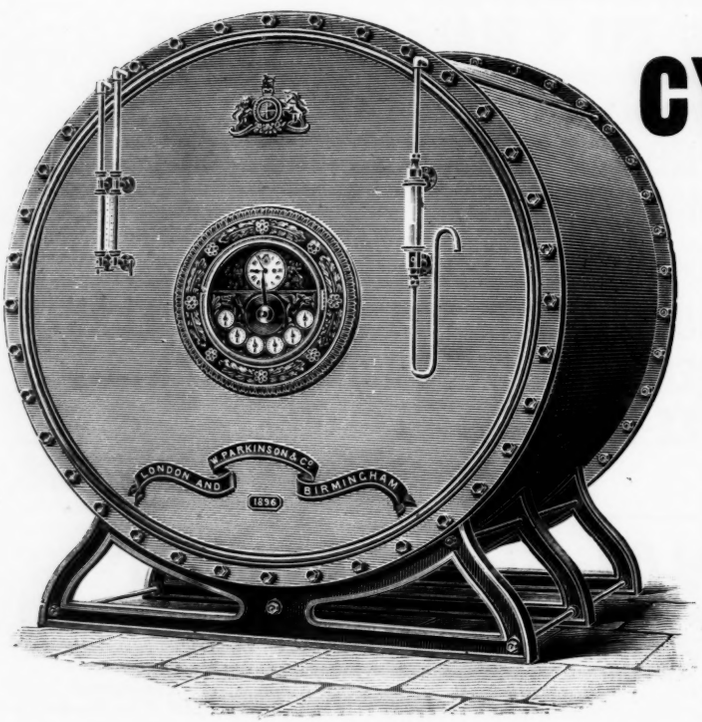

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VOL. XCII., No. 2216.—TUESDAY, OCTOBER 31, 1905.

EDITORIAL NOTES—GAS, &c.

The Meeting of the Midland Association.

THE meeting of the Midland Association last Thursday at Birmingham—held under the presidency of Mr. Thomas Berridge, of Leamington, and graced on this occasion by the presence of several distinguished visitors—fully sustained the reputation which these gatherings have acquired from the special interest which not seldom attaches to them. A unique feature of the proceedings was the illustration, by means of a valuable series of lantern slides, of Mr. Thomas Glover's explanation of the very important work of reconstruction which he has carried out and brought to a successful issue at Norwich. Through the courtesy of Mr. Glover, we were enabled, in our issues of the 19th and 26th of September last, to present to our readers a detailed account of this work, which is well deserving careful study by all who may be similarly situated. It seems that from time immemorial, there had existed at Norwich two separate and distinct manufacturing stations, situated about half-a-mile apart, the areas of which, for various reasons, it has not been found possible to extend. As a natural consequence of the growth of consumption, these areas not only became congested, but economical manufacture, according to modern ideas, was entirely out of the question with two separate establishments as then existing. Under such circumstances, the course that usually suggests itself is to seek for a fresh and possibly more advantageous site on which to erect new works in substitution for the old ones; but this is always a matter of some difficulty, to be avoided as long as possible. Avoided for a time it has been in this case, by recourse to an expedient which, so far as can be recollected, is without precedent. By his scheme of reconstruction, Mr. Glover has concentrated his coal storage, carbonizing, condensing, and scrubbing plant upon one site, and his exhausting, purifying, and measuring plant upon the other—taking care at the same time to improve the efficiency of the plant all round. What amount of margin has thus been secured for further increase of consumption can only be conjectured, but probably it is sufficient to last for the next few years; while the advantages of the plan, regarded solely from an economical point of view, are obvious. It renders supervision over the various operations easier than where the plant is disjointed; and in this case it has allowed of the application of almost the largest retort-setting in present use, in conjunction with the most approved forms of labour-saving appliances for coal unloading, stoking, and coke conveying. That exhausting and purifying should be done half-a-mile away from the place where the gas is generated, has not proved to be any disadvantage.

The task which Mr. Glover set himself to perform can have been no light one, for he was faced with the necessity of maintaining the supply while the works were in a state of transition; apart from which, reconstruction is always more difficult than the erection of entirely new works upon fresh ground. All the more praise to Mr. Glover for the manner in which it has been performed; and the Company are likewise to be congratulated not only upon the improved condition of their works, but also upon the great improvement in the position of their Norwich undertaking, as evidenced by the large increase in consumption which has taken place during the past few years. For this they are indebted to their previous Manager, Mr. John Young (now of Hull) no less than to Mr. Glover; and it must be a source of gratification to the former to witness the growth of the good seed which he sowed with a liberal hand.

Mr. Henry Fowler's paper on "The Painting of Gas-"holders," which had to be taken as read at the meeting of the Association held in May at Leamington, is an eminently practical one; and the observations it contains are such as could only have been dictated by actual experience. It is, as stated by the author, of the greatest importance for the preservation of all iron or steel work that it should have a coating of boiled linseed oil, with or without red lead, before any rust has collected on it; and also that all rust should be thoroughly removed from it every time it is painted afresh. We say "painted," because it is very much the fashion to paint gasholders; but where appearance need not be studied, there is no better preservative for them than a good coating of coal tar applied hot, and previously well boiled.

We wonder what was really in the mind of Mr. J. H. Brown, of Nottingham, when he wrote his paper on "Coal "Testing" for the delectation of the members of the Association at this meeting. Can it be that he seriously believes that, as he says in his opening sentence, coal testing has, during the last decade, fallen into disrepute; and that the method of testing which he describes and advocates is likely to restore public confidence in the results obtained? We think much better of Mr. Brown than to believe this possible, because it seems to imply an insufficient acquaintance with the subject of which he treats. What is the object of coal testing? Primarily, to ascertain comparative value for gas making. For this purpose it is not at all necessary, or even desirable, that the coal to be examined should be subjected to distillation in apparatus corresponding exactly to that which is used in what is called practical working; for this implies perfection in retort-house appliances which, as everybody is aware, does not exist. What is wanted is to find out the capabilities of the coal—to set up, as it were, an ideal to be worked up to, as near as may be, in actual practice. For this purpose the much-despised 2·24 lb. apparatus may prove of greater service than the larger and more elaborate appliances Mr. Brown so strongly favours. Condemnation should, in this view, be reserved for heavy expenditure in this connection, since all that is needed to secure reliable and comparable results is a simple and comparatively inexpensive apparatus. It no doubt frequently happens that coal, when tested in very small quantities, gives higher results than when it is tested on a working scale; but this is surely not to be set down as a demerit, provided the condition of the coal is the same in both cases. It may imply faulty working on the larger scale, which but for the small-scale test might not have become apparent. On the other hand, it has happened that higher results have been obtained on a working scale than could ever be reached with 2·24 lb. charges. The fact of the matter is that a very great deal depends not only upon the sampling of the coal as it is received, but also upon its treatment at the colliery. If a small quantity be sent away to be tested, this may represent either the richest or the poorest part of the seam; whereas the sample should be large enough to be representative of the bulk as consigned to the purchasers. We do not quite follow the author in his assertion that formerly the aim in coal-testing was to obtain illuminating power at the expense of quantity. The aim of all coal-testing, properly conducted, is, and has always been, to exhaust from coal all the gas it is capable of producing within practical limits. But we agree with him that calorific value rather than illuminating power should henceforward be the object of careful study. Mr. Brown did not find himself altogether in sympathetic company at the meeting; and this is not surprising.

The technical work did not monopolize the whole of the time of the gathering. Several other matters of interest helped to vary the proceedings; chief among them being the election of the officers for next year. Mr. Berridge is to be succeeded in the chair by Mr. Fletcher W. Stevenson; and Mr. Stevenson in the Vice-Presidency by Mr. J. H. Brown. Both these gentlemen are comparatively young in connection with the Association; but before their membership they were by no means strangers to the members. The choice in both instances is a happy one: and the members may look forward to a continuance of the prosperity and interest which has so abundantly attended the Association. Two popular reappointments were the Hon. Secretary (Mr. Meiklejohn,

of Rugby, and the Hon. Treasurer (Mr. W. R. Cooper). The President brought before the meeting a new source of income for gas-works, through the synchronizing of clocks by a temporary increase of pressure; but as there are so many influences in a distribution system to prevent the application of pressure at the gas-works having simultaneous effect in all parts of a district, to establish confidence more information is required. The Investigation Committee of the Association, however, are to look into the matter; so that in good time there should be complete satisfaction on all points. There has not been a very extensive consideration by the Association of the "Question-Box" proposal; but the members, towards the end of their long meeting on Thursday, were quite disposed to accept the *ipse dixit* of Mr. George Helps, that there is little, if any, good to be got out of it. Whether or not Mr. Helps is right, it must be conceded that the "Question-Box" is not a plant of vigorous growth in this country.

Society of British Gas Industries.

It is, to say the least, a no mean gratification to us to find, from a circular issued last Friday, that the representative Committee appointed by the meeting of gas-works contractors and manufacturers of gas plant and appliances held at the Holborn Restaurant last February, have unanimously endorsed the suggestion made in the "Journal," that the time is opportune for the formation of an organization composed of that active and influential section of the gas industry that supply the material, plant, and necessities for the manufacture, distribution, and consumption of gas. How greatly and assiduously those of this section have worked in the improvement and the perfection of gas plant and appliances, and how greatly they have assisted in the progress along the road of development, no one but those who are deliberately hostile will deny; and their denial cannot be a conscientious product. That all members of the aforesaid Committee have signed the report, which is virtually a recommendation that a Society under the title of "The Society of British Gas Industries" should be forthwith established, must carry weight at the general meeting that is to be held on Nov. 23; and we look hopefully to the complete ratification of the Committee's views on the occasion. It cannot be said that the idea has been hastily accepted. A full twelve months will have passed by the date of the meeting from the time the suggestion was published, and at which time the contractors and manufacturers of plant and appliances were evidencing at Earl's Court that they were a body strong and vigorous, with the interests of the industry at heart, and prepared to do their part to foster its prosperity, and, as the reward, to enjoy with the capitalists of gas undertakings the proceeds of their enterprise.

The Committee's report is a business-like document—both succinct and distinct. It is also the pledge of two things, that the aim is to give their part of the industry a recognized standing and influence, and that the Society is to be "in no "way antagonistic to the Institution of Gas Engineers, but "is rather to work in conjunction with that Institution for the "advancement of the gas industry as a whole, thereby "securing its highest interests." The vista of usefulness is indeed a pleasant one; and, with a Council composed only of principals, there cannot be any hesitation on the part of the Institution of Gas Engineers in inviting the co-operation of the Society on all possible occasions—in investigation, in special discussion, and in numerous ways that in due course must present themselves. In such matters, the Institution can better approach an organized body than take the somewhat invidious step of appearing to favour individual firms. It is thought by the Advisory Committee that it may be advanced as an argument against the formation of the proposed Society that, at the present juncture, there is an absence of what might be termed any question of supreme importance to the gas industry. But with logical conclusiveness they contend that it is sounder policy to form a Society before such a question arises than to wait and make the advent of that question the main reason for forming a Society. The Committee, we think, have gone a little astray in allowing the correctness of any assumption that there are no questions of supreme importance before the industry at the moment. There are momentous matters in which they are very intimately concerned. There is the question of the reduction of the illuminating power of gas, with the view of bringing it to a character in agreement with the changed requirements of the times, in order the better to further develop business. There is also the renewed struggle on the part of electricity to repress the supremacy of gas both for public and private lighting; and there are, again, the vigorous competitors in the shape of producer gas and electricity for power purposes in the industrial field. It requires no great mental exercise to see that, in these contests, the gains of the gas-supply industry will be the gain of the gas-works contractors and manufacturers of plant and appliances; the losses of the former will be to the loss of the latter. Their interests are thus strongly allied; and the opportunities of the contractors and gas plant and appliance manufacturers to align themselves with the gas suppliers in the defence of those common interests, by demonstration, recommendation, and otherwise, are not a few.

Appended to the report of the Committee is a statement which brings to a focus the proposed objects of the Society. They are, *mutatis mutandis*, of ordinary form; and they will, if accepted and the Society is founded, give them a large scope for useful work both for their own behoof and that of the industry generally. Until, if it should be the happy event, their final approval, it would be (seeing that they may undergo amendment) out of order for us to publish the drafted objects or the rules. We would, however, suggest to the Committee two slight additions in the phrasing of Objects Nos. 2 and 3; the additions being the italicized words: In Object No. 2, "Gas Works Contractors "and *gas plant and appliance* manufacturers;" and in Object No. 3, "To give the Legislature and Public Bodies, *the* "*Institution of Gas Engineers, the District Gas Associations*, and "others facilities," &c. The first amendment makes the statement of the object more comprehensive, and accords with the intention; and the second one will definitely infuse into the specified "Objects," the spirit of the Committee's declaration of a desire to work, as an organized body, "in "conjunction with the Institution for the advancement of "the gas industry as a whole."

One word more. If the present opportunity is missed by those chiefly concerned in this matter to obtain for themselves a corporate existence—giving them a status that they do not at present possess, a field of usefulness in which they cannot with such effect individually engage to the benefit of the industry through which they exist, and facilities for social intercourse—then a similar favourable opportunity may be long in its coming. Mayhap, it will never again come.

To Gas Companies Under the Sulphur Clauses—The Illuminating Power Test-Burner.

Considerable importance attaches to the proceedings at the meeting of the Gas Companies' Protection Association on Friday; and we ask the attention of the Gas Companies concerned to what transpired, and to a proposal that was made for the benefit of those who are at the present time working under the sulphur clauses. In the first place, however, it should be said that the report of the Committee, which the Chairman (Mr. H. E. Jones) presented, illustrates an energy and usefulness which it is amazing that less than one-fourth of the statutory gas companies of the country recognize—it may be supposed through, on the part of the other three-fourths, ignorance of the work done, a feeling of sublime self-sufficiency, or apathy on the part of Directors. Whatever the cause, the report and proceedings on this occasion should scatter aloofness, and give a greater operative power to the Association by a large accretion to its strength. The report, among many other matters, shows the activity of the Association in connection with the struggle for bringing municipal electricity supply under greater parliamentary control; and the ground gained last session should be an encouragement in the future not to allow any opportunity to slip for the want of trying to compel municipal electricity supply to be conducted on business principles. The increase in precedent is of the utmost importance. The Association have also taken Counsel's opinion on the doubtful point as to whether an official receiver or trustee, after a debtor has been adjudged a bankrupt, could compel a gas company to furnish a supply of gas without the receiver or trustee guaranteeing to pay the arrears of the gas-rent then due. The opinion is against the suggested liability.

The foregoing are samples of the contents of the report. But the paramount question before the members was a

proposition emanating from Sir G. Livesey, the feasibility of which had also been discussed by other members, as the report of the proceedings discloses. It is a proposal for a joint appeal to Parliament, by those Companies who are cumbered by the restrictive sulphur clauses, for the relief that has been granted (as the issue of the recommendation of the Departmental Committee of the Board of Trade) to the Metropolitan Gas Companies and the South Suburban Company. The application can only be made by way of a Bill—not a general one; but affecting only those of the 45 Companies interested who unite themselves with its promotion, and share in the expense. The Association have agreed not to confine the invitation to join in this action to the Companies under the sulphur clauses who are members of the Association, but to give all an opportunity of uniting themselves with the attempt to secure the relief in the next session of Parliament. The formalities connected with the promotion of the measure will have to receive attention almost immediately; and therefore there must be no delay in the matter. It should not take any Board of Directors—whether or not they wish to immediately discard lime purification—many minutes' consideration to see that freedom is better than restriction, that combined action of this kind is more likely to succeed than individual action with an inimical local authority in opposition, and that the banding together in the matter of the settlement of the costs will be for each of the companies an almost insignificant consideration. To strike iron while it is hot is an effective method of making the desired impression upon the iron; and to follow with a joint Bill of the kind proposed in the session immediately following that in which the Metropolitan Companies obtained the emancipation that the Departmental Committee of the Board of Trade recommended they should have, must have considerable effect in disarming local opposition.

The indications are that the local authorities themselves are not quite so heedless that they do not see the futility under the circumstances of raising strong objection; but there are those who, while they possess the power to haul a gas company before the Courts for an infraction of the law—however much that law is opposed to commonsense and latter-day parliamentary abrogation in the case of the largest of gas companies—will not hesitate to austerely exercise it. Only last week the Tottenham and Edmonton Gas Company appeared in a Police Court through an infinitesimal excess of sulphur; and this is a Company one of whose foremost principles in behaviour has been to encourage harmonious relations with the Local Authorities, and to the advantage of the consumers. What happened in Parliament last session, however, showed the Magistrates the absurdity of this particular feature of the law they have to administer; and the nominal penalty of 10s. and costs which they inflicted upon the Tottenham Company brought their view of the absurdity into stronger relief. No doubt the Authority who instituted these proceedings will claim that they were only actuated by duty. On the other hand, the Wandsworth Borough Council regard the specific enactment of this duty among their multifarious others as being somewhat ludicrous and obsolete when Parliament has deliberately removed that duty from the controlling authorities in the huge Metropolitan districts served by the three London Gas Companies. The Borough Council have therefore resolved not to test for sulphur impurities in the case of the Wandsworth Gas Company, but to give to the Company the facilities enjoyed by their neighbours. The action of Parliament, however, in respect of London, will not have the same softening effect upon all local authorities. Therefore the invitation to join in the application to Parliament to repeal the sulphur clauses in the case of those companies who desire to be removed from the servitude, should not be disregarded; but immediate communication should be made with the Secretary of the Gas Companies' Protection Association (Mr. F. E. Cooper, 5, Victoria Street, S.W.), signifying a desire to take part in the promotion of the proposed Bill.

Another important announcement was made by Sir George Livesey respecting the question of the illuminating power test with the fixed 5 cubic feet rate of consumption. The tokens are, though it is still an open question, that the matter will not be ripe for further discussion in Parliament next session. The point is now as to how the Referees will construe the powers that have been placed upon them by the London Gas Bill; and their action is awaited with great interest. Meanwhile, the three London Gas Companies have unitedly submitted a test-burner (devised by Mr. Charles Carpenter) that they are of opinion will be suitable for giving effect to the terms of the Act. Care will have to be exercised over this question of the illuminating power test by Companies applying to Parliament in the coming session; and it will be an advantage to them and will inure to future uniformity, if the testing clauses in Bills are drafted in as general a manner as possible, so that the type of test-burner and the method of use hereafter applying to London may be used in testing the promoting company's gas. It must not be forgotten that the test-burner for London is to be of the best possible kind for developing the fullest illuminating value of the gas, whatever its statutory denomination, and to that definition of the burner those chiefly concerned will not only now but in the future give that close attention which will ensure its strictest observance. The importance of this to others is perfectly obvious.

Death-Dealing Illuminants.

THE last issue to hand of our versatile and instructive American contemporary, the "Acetylene Journal," contains a valuable compilation of the reports of deaths which have occurred in the United States through accidents with illuminating agents. The aim has been to give a complete record of all such accidents during two months beginning on July 1 last, as reported in newspapers. Obviously, such a record will fall considerably short of the total number of fatalities from such causes, owing to the absence of correspondents in remote districts. Nevertheless, no fewer than 300 deaths represent the toll of human life paid in that short period, in one country only, for the convenience of artificial illumination. Presumably, acetylene will appear from the statistics to be blameless; but with the safety of an illuminant which is relatively but little used, we are not immediately concerned. The statistics, however, so far as they have been already published, do carry a significance with them of which their compilers recked but little. It is doubly interesting to have the testimony which they afford as to the safety of gas lighting, as compared with other modes of illumination, from a source which is unlikely to be biassed in its favour.

The details given by our contemporary are the place and date of the accident, usually the name of the fatally injured person, the source of the information, and the illuminating agent concerned. The list, as published so far, extends from the 1st to the 20th of July. These three weeks saw a total of 108 people done to death by the following agencies: Electricity, 47 people; gasoline, 34 people; kerosene or other oil, 24 people; natural gas, 2 people; coal gas, 1 person. It will be an eye-opener to many to have this striking testimony as to the danger of electricity, which exceeds even that of gasoline—a material almost tabooed in this country as an illuminant on account of its risky character. The consoling feature of the statement is the fact that coal gas, despite its extended use, gives cause to less than 1 per cent. of the fatal accidents arising from artificial illuminating agents.

The Lighting Question at Croydon—A "Personal Attack."

We are sorry that Alderman Miller, the Chairman of the Lighting and Electricity Committee of the Croydon Corporation, should, if he does so sincerely, regard the last article that appeared in the "JOURNAL" on the subject of the public lighting of Croydon as in any way a "personal attack" on him. It was merely the accident of his Chairmanship of the Committee, and therefore as its mouthpiece, that brought his name into prominence in attempting to remove from his allusions to public lighting in other places some of the glamour which his statements appeared to possess for many of his colleagues on the Council. We have the satisfaction of knowing, however, that the veracity of what was put forward in our article has not been impugned by the Alderman, and we might go farther by challenging disproof. It was not too much for the Alderman to collect the information that he laid before the Council; and therefore it should not be beyond his power of endurance to satisfy himself as to the truth of what was advanced in opposition to the line he took up in the furtherance of his own particular cause. We cannot believe that, with Alderman Miller's long connection with public life, he is so thin-skinned as to look upon adverse discussion of his public utterances as a personal

attack. This "personal-attack" argument is such an old one in Council chambers, and has so often served its purpose at the time of voting, that Alderman Miller, it is hoped, will not entertain any feeling of this being another "attack" if we are disposed to regard in a somewhat humorous light his mention of the matter in the Council yesterday week. The Alderman, we know, is highly respected in Croydon; and the respect is certainly not limited to the borough. But as Chairman of the Lighting and Electricity Committee, surely he must be dealt with in controversy affecting it and its work.

Comparison Shunned.

Though long experienced, we have not as yet come across a Chairman of a Corporation Electricity Committee who, when gas is mentioned, can be held up as being exactly the paragon of the virtue of impartiality; but that has been claimed for Alderman Miller. Let us see how far the event in this case accords with the claim. The Croydon and the South Suburban Gas Companies offered to bear the whole cost of demonstrating improved gas lighting at (if wished) quoted figures in comparison with anything the Electricity Committee chose to do to compete with that lighting. But the Electricity Committee—their silence on the matter permits of only the one inference—shunned the business-like offer before (and subsequent to the offer) urging on the Council an extension of arc lamps. That is a strange form of impartiality; and certainly the action does not betray any earnest desire for consideration of the whole subject in the interests of the ratepayers' pockets. The test-proposal of the Gas Companies had had no opportunity of acceptance or anything else when the Electricity Committee brought forward their propositions yesterday week for two extensions of cables and the adoption of flame arc lamps; and they carried the recommendations before any vote was taken on the motion that had previously been introduced by Mr. Councillor Price, which contemplated the invitation of propositions from the Gas Companies. In view of this treatment, Mr. Price declined to proceed with his motion. The Committee have nothing to be proud of over their methods. Discussion and demonstration would in all probability have made a vast difference in the opinion of the Council, who, at the moment, appear to be swayed more by an affectionate preference for their own electricity undertaking than for the ratepayers.

How Money is to be "Saved."

One of the extensions—in Mitcham Road—supplies the illustration. Mitcham Road has not the importance about it of a central main thoroughfare. But several hundreds of pounds (the "estimate" is £882) are to be spent on this installation; and from the character of the district we should imagine that there is little supplementary business to be had there from electricity. It is proposed to use 32 magazine flame arcs in the road, at a cost of £12 10s. each per annum. This comes to exactly £400 a year; but Alderman Miller was cautious, and said "he believed" it would be about £400. On top of this falls the sinking fund and interest. There are no particulars to show whether this piece of lighting is going to be profitable to the Electricity Department; and it would be of interest, and to the general good, if the Electrical Engineer would supply the details, seeing that these lamps have not, so far as we are aware, yet been employed for street lighting under ordinary conditions, other than at special centres. Alderman Miller said that what he had done had been "solely to save money." This is a peculiar way of "saving" money. It is pretty plain that the lighting of this one road is going to cost the ratepayers—reckoning the sinking fund and interest—something like £500 per annum. Judging of the present lighting of Mitcham Road, it cannot cost the Corporation but few sovereigns more than £100 per annum; and mention of a much greater sum must be a mistake. Supposing the present lighting was doubled or trebled, there would then be a considerable saving on what the Electricity Committee are proposing for the ratepayers. The Corporation ought not to judge of the economical improvements the Gas Companies can make from single incandescent lamps spaced out (as the Gas Companies' statement recently showed) at an average distance of 105 yards, nor take Kingsway as the standard of illumination required. Kingsway is by no means a narrow street such as are most of those in Croydon; and the system of measurement of distance that Alderman Miller, or whoever acted for him, adopted to get his 20 yards distance (he meant 24 yards) was one that might apply very well to a narrow street, but not one of the width of Kingsway. Kingsway is 100 feet wide including the footways. Longitudinally, the lamps are 48 yards apart, and are placed on the hit-and-miss principle. So that diagonally measuring across the road they are 32 yards distant. What was done by, or for, Alderman Miller was to divide the longitudinal measurement into two, because there was a post at that point on the other side of a 60 feet wide roadway. It is a rather laughable proceeding; and as distances for lamps are measured, what Alderman Miller said was totally misleading. Further, the £15 for lighting and the maintenance of the high-pressure gas-lamps in Kingsway compares with £27 quoted for electricity. And there were two Local Authorities concerned in the decision of that contract. It comes to this, that Alderman Miller carried his motion largely owing to the fact that the Council are possessors of the electricity undertaking; most of the members no doubt being oblivious to the fact that patronage of their own concern simply means adding to the burdens of the ratepayers. Mitcham Road is an example. Improved lighting could have been obtained at greatly less expense than is represented by the difference between (perhaps a little more than) £100 and about the £500 which the Council so freely voted for electricity. We cannot congratulate the Committee on the methods by which they obtained this extra lighting.

A Long Delayed Reduction at Rochdale.

The customers of the Rochdale Corporation who take gas for lighting purposes have for some time been suffering from "hope deferred" in the matter of a reduction in price; but as apparently they have known how to wait, the concession has come to them at last—although it is smaller than at one time seemed probable. In July last, the Gas Committee recommended a reduction of 3d. per 1000 cubic feet in the price of lighting gas and this would doubtless have been agreed to (as were concessions to other classes of consumers) had not the Corporation suddenly found themselves called upon to carry out some sewerage works which had not been allowed for in the year's estimates. The money had to be found; and right at hand was an easy means of securing it—namely, by making the gas consumers pay Truly, the municipal gas undertaking has many uses. Turning from Rochdale for a moment, it will be seen that at Manchester the Gas Committee have been requested to pay the bill incurred in connection with the late royal visit. This will make the reserve fund of the undertaking some £9000 poorer; but it has obviated the necessity of calling upon the ratepayers directly for the money. Knowing so well Alderman Gibson's views on the question of the appropriation of profits in aid of the rates, it is easy to understand his refusal, on behalf of the Committee over which he presides, to voluntarily make the contribution; but the Council willed what one member called a "foolish and undignified" thing, and so it has been done. It is to be hoped that the extreme simplicity of the operation will not tempt either Manchester or Rochdale to further call upon their gas undertakings in this way. In connection with the question of a reduction in Rochdale, the Engineer and Manager (Mr. T. B. Ball) prepared an interesting report, which is abstracted in another part of to-day's issue. Mr. Ball set out to show the influence of each class of consumption on the cost of producing gas; and his conclusion is that, if supplied at cost price with 100,000 cubic feet of gas, a power user would pay about 1s. 1d., a mill consumer taking the same quantity would pay 1s. 5d., and a very small consumer burning 4000 cubic feet a year would pay 3s. per 1000 cubic feet. But, of course, the proportion to the total consumption of gas of that used by such small consumers as the last named is extremely small. The cost price of 3s. per 1000 feet therefore, while it doubtless applies to a considerable number of consumers, has reference only to a very small percentage of the output. Taking the sales all round, there was last year a clear profit of nearly 10d. per 1000 cubic feet, so that the reduction of 2d. to lighting consumers (apart from the concessions granted to power users) cannot be looked upon as likely to seriously drain the undertaking, even if the smallest consumers are already supplied at a loss. Mr. Ball's report shows clearly the prior claims of large consumers over small ones in the matter of low price—indeed, one member of the Council has stated that if the question of the charge to lighting consumers is gone into again at some future time, he should be in favour of knocking 3d. per 1000 cubic feet off the price to the largest consumers, 2d. to the medium consumers, and 1d. to the smallest consumers.

A Lighting Estimate.

As the Exeter City Council have decided to invite the Gas Company to furnish a report and estimate on the cost of lighting the streets of the city, there is reason to hope that the subject will receive full, if not impartial, treatment before a final decision is arrived at as to the system to be adopted. The report which has been made to the Council by the City Surveyor and the Electrical Engineer makes no pretence to impartiality. It is a piece of special pleading in the interest of the municipal electricity undertaking, which is not so flourishing but that it would welcome a customer which would not only contribute a steady yearly income, but would furnish an excuse for laying cables in every street of the city. As it is worded, the report does not present materials for any exact comparison. To begin with, however, there is to be a capital outlay for 27½ miles of cables of £10,381 10s., with an additional sum of £6050 to make the cables of sufficient size to meet the requirements of possible private users of electric light in some of the streets into which it would then penetrate. Leaving this latter item out of account (as one which has no connection with the public lighting of the city), it is stated that under the new conditions, the total cost per annum would be £4831 10s. The difficulty is to understand what is here meant by "total cost." At present, gas lighting is costing the city £4210, and electric lighting £860—a total of £5070. If after its proposed outlay of £10,381 on cables, Exeter is to have the whole of its streets lighted for £239 less than is paid at present, there are a good many electrical engineers who will be glad to learn from Exeter how it is done. We scarcely think, however, that this is what is really meant. As a matter of fact, it appears that in the limited area in which the municipal tramways are laid, and in which it is proposed to utilize the poles carrying the trolley wires as electric lighting standards, electricity will cost 43 per cent. more than gas. If we apply this figure to the whole of the gas lighted area of the city, we get, instead of a decreased cost, an actual increase of no less than £1823. It is true that the Electrical Engineer and the City Surveyor promise, for the additional charge upon the rates of 43 per cent., a great increase in the amount of light, and rather go out of their way to assert that gas cannot produce such results. It will be time for the Council to pronounce authoritatively upon this point when they get the estimate of the Gas Company. In the meantime, it is satisfactory to find that they are not prepared to accept, without inquiry, advice which would have the certain effect of increasing the rates, and is by no means sure to produce anything like compensating advantage in increased efficiency of lighting.

British Association of Water-Works Engineers.

The winter meeting of the Association will be held in the rooms of the Geological Society, Burlington House, on Saturday, Dec. 16. We are informed by the Secretary (Mr. Percy Griffith, M.Inst.C.E., F.G.S.) that two papers will be presented for discussion—one dealing with the municipal control of water-works, by Mr. C. H. Priestley, M.Inst.C.E., a Past-President, and the other with the working costs of pumping, and describing a large underground reservoir at St. Helens, by Mr. J. J. Lackland, M.Inst.C.E., one of the Council of the Association. We are asked to mention that the question of the revision of the rules will be considered by the Council on the day preceding the meeting, with a view to a special general meeting being called at a subsequent date, of which due notice will be given.

The Southern District Association of Gas Engineers and Managers.—We are informed by the Hon. Secretary, Mr. J. W. Helps, that a meeting of the Southern Association will be held at the Hotel Cecil on Thursday of next week, the 9th prox., at 2.30. After the election of President, Vice-President, and officers for 1906, the following papers will be read: "Oxide Purifying Boxes," by Mr. Norton H. Humphrys. "Steam Turbine Driven Exhauster for Increasing Pressure in Gas-Mains," by Mr. R. Herring. "An Experience in the Reconstruction of Works," by Mr. R. M. Couper. At the conclusion of the business high-tea will be served.

Brackenbury's "British Progress in Gas-Works Plant and Machinery."—In a previous issue of the "JOURNAL" it was mentioned that His Majesty the King had been pleased to accept a copy of Mr. C. E. Brackenbury's book on "British Progress in Gas-Works Plant and Machinery." We learn that another copy has been accepted by the Prince of Wales, who directed his Private Secretary (Lieut.-Col. Sir Arthur Bigge, G.C.V.O., &c.) to send from the *Renown*, when the vessel was at Genoa, a letter conveying His Royal Highness's thanks to the author for the book, and for the good wishes he had expressed for the Princess and himself, and for their voyage in the East.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 335.)

THE Stock Exchange has had another depressed week, but not altogether unmixed with light and shade. Perhaps if it had not been for the serious anxiety caused by the intelligence regarding the Russian Revolution, we might have seen a fair degree of improvement in the general position; for the old money worry was beginning to wear itself out. Even as things were, the close was much better than the worst of the week. There are signs of improving trade in the country—a phenomenon that is badly wanted to cure many evils, and, most of all, the Unemployed difficulty. It was account week; and this gave rise to a little anxiety, but so far all is believed to have gone well. In the Money Market there was a strong demand and rates kept stiff, though towards the end of the week there was a relaxation, and discount prices were firm. In the Gas Market, business was no better than moderate, and on some days it was very light. It was only to be expected that in this market, as in others, values would undergo some shrinkage; and this has been the case, but to a very limited extent. And it is most noteworthy that the cheapening has been confined to the London market; while in the leading Provincial exchanges, the local undertakings continued to advance, and some of them now command unusually high prices. Moreover, of the issues dealt in on the London market, those which were most affected were among the choicest class. In Gaslight and Coke issues, the ordinary was much quieter than the previous week, and it was a little easier. The prices marked, which had ranged from par to 100½ until Saturday, then gave way to 99½ and 99¾, and the quotation closed one lower. Of the secured issues, the maximum marked from 90 to 91; the preference from 111½ to 113; and the debenture 85½ and 86; the latter losing one point in quotation. South Metropolitan was not much dealt in, and receded a point. The prices at which stock changed hands were from 128 to 129½, with a small amount done free at 127½. The debenture was done at 87½. In Commercials, the 3½ per cent. marked 112½. The Suburban and Provincial group were very quiet. Bournemouth "B" advanced and marked 17½; Brighton original was done at 223; British at 43½; Bromley "A" at 122½; and Lea Bridge at 125. The Continental Gas Companies were quiet and firm. Imperial marked from 220 to 221½; European 22½, and ditto part-paid 15 and 15½; and Union from 119½ to 120½. Tuscan was done at 9⅞. Among the undertakings of the remoter world, Bombay changed hands at 6⅞, Oriental at 148, and Hong Kong at from 20 to 20½. Buenos Ayres marked 12¾, River Plate 13⅛ and 13¼, and ditto debenture 98. Primitiva ordinary changed hands at 6 13/16 and 6⅞ ditto preference at from 5⅝ to 5 7/16, and ditto debenture at 98 and 98½. Monte Video was done at 12¾.

The closing prices are shown in our Stock and Share List on page 335.

ELECTRIC LIGHTING MEMORANDA.

Estimates and Actual Costs—Mr. Frank Bailey's Photometrical Tests of City Gas and Electric Lamps—Costs of the Fleet Street Lighting—An Electrical Engineer's Confessions—The Electrical Cookery Competition.

REALLY the electricians must moderate their views as to the capacity of the public to swallow all they choose to put before them. Fickleness of conduct does not assist in producing confidence; and there has been a great exhibition of fickleness lately. Throughout the country there has been lamentation over the burden that public lighting by electricity has cast upon the ratepayers. But, lo! the recognition of the cheapness and efficiency of incandescent gas lighting, and the "bolts from the blue," or from somewhere else, that have fallen among the electricians have disturbed their peace of mind, and all round they are confessing that there has been a shameful robbing of the ratepayers. Ratepayers the country through should study the figures that have been published by the "Electrician" recently, and then ask their representatives, "Wherefore is it you are charging us £18 to £26 (as the case may be) per electric arc, when electrical engineers are telling us they can give the same amount of light from, as their fancy dictates, £8 to (say) £16 per lamp?" The great margin is not ours; it is supplied by the figures published. If these figures could get round the country, there would be terrible trouble in the camps of the Electrites. The "Electrician" gives us another example this week, which works out to £16 10s. per lamp; but the price at which the necessary 2200 units are charged at is 0·6d. per unit. Most previous calculators have hopped between 1d. and 2d. per unit. Take 1d. in this case, as we do not like to see this plundering of the electric light undertakings, and the price of the arc lamps would be over £20 apiece. Many undertakings wish they could afford to come down to 1d.

Our friends of the "Electrician" have also warmed up again a part of Mr. Frank Bailey's Olympian lecture on arc lamps. In that lecture he referred to some photometric tests (made with the peripatetic photometer) of the new gas and old electric lighting in the City, together with the samples of flame arcs that are to be found at the Blackfriars Bridge end of Queen Victoria Street. Mr. Frank Bailey, as the Engineer of

the Company who have been pulling in the shekels from the ratepayers of the City for the old arc lamps at the rate of £26 each, has also—it is most extraordinary—found, since the new gas-lamps were installed, that electric lighting can be done much cheaper than his Company were charging. At the same time, even the old arc lamps—this is getting painful—cost less "per candle power per annum" than any gas-light. The pity, from the ratepayers' point of view, is that they did not cost less than £26 each per annum, and give a better distribution of their wonderful illuminating power, instead of so carefully conserving the greater part of it for the ground and objects (including upper storey windows) in their proximity. Well, now Mr. Bailey has given our contemporary a table setting out the tests that he has made with his rambling photometer in the City. Mr. Bailey is not a disinterested person; but we will not say that he and his friends did not do all they could to secure such accuracy as is to be obtained in outdoor exercises of the kind. That they did not obtain accuracy, is apparent from the table. The figures afford no proof of efficiency for street illumination; but what they do show is that the gas-lamps, even with the queer candle powers attributed to them, are as efficient in distributing their light as the marvellous electric lamps. The illuminating power of the ordinary double-burnered incandescent gas-lamps was measured at 21 ft. 8 in. from the lamps, a single high-pressure burner at 23 ft. 8 in., a double-burner high-pressure lamp at 28 ft., an old type electric arc at 37 ft. 2 in., and a flame arc at 37 ft. 2 in. The height of the photometer screen was 6 ft. 2 in. above ground level—above an average mortal's head. The angle of light-rays of the horizontal plane is given as: For the three types of gas-lamps respectively, 11·5°, 12°, and 15°, and for the electrics 18°. The angle of incidence of the light rays to the ground is given for the three types of gas-lamps as 78·5°, 78°, and 75°, and for the electric arcs as 72°. Now, considering the alleged illuminating powers, and the relative positions of such lamps in the matter of distances in ordinary lighting, these figures are (though coming from an electrician) not unfavourable to the gas-lamps in point of distributive power. The much-lauded flame arc is seen to be not a whit better than the old arc lamp in point of distributive power—the figures being precisely the same. After all, these figures are only of academic interest; for the great variations in heights, distances, &c., render them useless for practical comparison.

Now as to the mean illuminating powers obtained. If we come to take those for the gas alone, we have ample proof of the unreliability of the tests. Mark this! Mr. Bailey ascribes a mean illuminating power of 129·1 candles to a double ordinary burnered incandescent gas lamp. We will take this as being approximately correct; the duty per cubic foot of gas consumed being equal to 18·4 candles. Then we come to the single-burner high-pressure lamp, and the mean illuminating power is given as 150·4 candles, which is only a duty of 15 candles per cubic foot. This is 3·4 candles less per cubic foot than is obtained from the common "C" burners, at usual district pressures. So where comes in the advantage that science, photometric study, daily experience, and the visual test that can be made in the City, all tell us comes from using gas at higher pressure than ordinary in connection with incandescent gas lighting. But the amusing aspect of these figures does not stop here. Although the single burner high-pressure gave a mean of 150·4 candles, the double-burnered high-pressure lamp only returned a mean of 244·5 candles, which brings down the duty to about 12·24 candles per cubic foot, while the double-burnered low-pressure lamp gave 18·4 candles per cubic foot. Does Mr. Bailey seriously intend that people should believe in figures that can be proved inaccurate by an elementary test drawn from themselves? On their very face, their absurdity is pronounced. We take it these are the figures from which he worked out the cost of the candle power per annum. Surely, if Mr. Bailey, or any one else continues to quote these figures, he will expose himself to well-deserved ridicule. After these deplorable looking figures for high-pressure gas, it is not astonishing to see that the old arcs, which have been admitted by Mr. Bailey to be worn out and are encased in much-ribbed lanterns, give such a wealth of light in a portable photometer that the mean illuminating power registered is 659·4 candles. From smiling we try to refrain; but the effort is great.

Then we come to the tests made with one of the flame arcs at Blackfriars Bridge Approach. We read that it was in "fairly good order" (the tests were made soon after these lamps were installed), but "not the best of the set of four lamps." The reason this lamp was chosen was that "the other three were difficult to test owing to their mutual influence." Examination of the four arc lamps at the place indicated does not reveal to us how any one lamp could really avoid some of the "mutual influence" of the others for photometric purposes; and we are confirmed in this view, when we see that, although the lamp was only in "fairly good order," it gave 1317 candles as a mean of the readings at 37·5 feet from the lamp. How very wonderful! Perhaps there was also a little helping "influence" from the neighbouring high-pressure gas-lamps. However that may be, Mr. Bailey's figures coincide with the experiments of other investigators that these flame arcs are not any better distributors of light than ordinary arcs; seeing that, in both the old City arcs and the flame lamps, the angle of light rays to the horizontal plane is 18° and the angle of incidence of light rays to the ground is 72°. How then, for the purpose of ordinary street illumination, are these lamps superior to the old arcs, or, accepting the figures Mr. Bailey gives in this respect, to the much-abused (in these experiments) high-pressure gas-lamps or the fairly well-treated ordinary incandescent gas-lamps. We leave to Mr. Bailey and the "Electrician" all the comfort they can extract from figures of such a pronounced worthless character.

The suggestion recently made in the "Electrical Times," that the Gaslight and Coke Company's terms for the City gas lighting are under cost, is absolutely without foundation. By a simple calculation applying to the Fleet Street lighting (which the "Electrical Times" could have made as easily as ourselves), we showed last week that the insinuation only evinced the weakness of the case of those who made it. We have since obtained the exact figures for Fleet Street, and offer them for digestion by those who have harboured doubt. Each lamp is fitted with two burners, governed to prevent them consuming more than 3½ cubic feet of gas per hour during 4300 hours of lighting, *plus* ⅜ cubic foot per burner for bye-pass lights during 4460 hours of daylight. The total consumption per two-burner lamp is, therefore, 33,100 cubic feet per annum, which, at 2s. 2d. per 1000 cubic feet (the Gaslight and Coke Company's regular price for gas used for street lighting), costs £3 11s. 8d. For lighting, extinguishing, and cleaning twice weekly, repairs and painting, and mantle renewals, the inclusive charge is £2 1s. 6d.; so that the total charge is £5 13s. 2d. per double-burnered lamp per annum, at which price, we have not the slightest doubt, the Gaslight and Coke Company will be happy to supply as many similar street-lamps as the City or any other authority in their area are disposed to erect. Thirty-four lamps at £5 13s. 2d. works out to just £192 7s. 8d. The total cost for the 34 low-pressure lamps (which together give an effective lighting power of nearly 5000 candles) is really £15 less than the figures originally published, as the City thought of putting some three-burner lamps in the street, but subsequently determined that two-burner ones would suffice. They have, however, erected in addition, for the lighting of the refuge by Fetter Lane, a 1000-candle power high-pressure lamp, for which the charge is £18 per annum, including all cost of maintenance, gas compression, &c. So that the final and corrected figures for the lighting of Fleet Street are: Total effective candle power, 5800; annual cost, £210. The mare's nest which the writer in the "Electrical Times" also discovered when he quoted a recent statement by Mr. Morton as to the Corporation having had its difficulties with the Gaslight and Coke Company on the question of price, is an amusing one; and the explanation may be given here. What Mr. Morton was alluding to was the dispute between the Company and the Corporation some years ago (which was made the subject of a Board of Trade arbitration) on the question as to whether the Company were obliged to charge all the gas used by the Corporation at the street lighting price whether used for street lighting or for other purposes. The decision of the arbitrator was in favour of the Company. There has been no question whatever between the Streets Committee and the Company over the matter of the prices to be charged for the new lamps in Fleet Street, Queen Victoria Street, and other places. The Company quoted terms based upon the ordinary street lighting price, and their usual scale of charges for attendance and maintenance; and those terms were never questioned by the Streets Committee or adjusted in any way. The extreme annoyance of the electrical papers over the success achieved by gas is a very good measure of the value of that success to the gas industry.

There was an article in the engineering supplement of "The Times" last week on the "Standardization of the Electric Light," which, coming from an electrical engineer in the person of Mr. Leon Gaster, is more remarkable for the confessions he makes than for any masterly skill in presenting his plea for funds for the establishment of a properly equipped photometrical intelligence department at the National Physical Laboratory. With his plea we are fully in sympathy, providing the danger of such a department being dominated by electrical influence is averted. But to the confessions of Mr. Gaster. They cannot be improved by comment; and so we extract a few for the information of our readers: "There is hardly a field where there is a greater waste going on than in the conversion of electric energy into light. . . . It must be remembered that the consumer of electric energy pays for the sum total of the energy expended in invisible radiation, that wasted in heating the air, and the useful visible radiation. This last, the only effective portion of the whole energy paid for, varies from 3 per cent. to 6 per cent. of the total, according to the nature of the lamp used. . . . It is known that the ordinary incandescent lamp diminishes considerably in candle power with use—some types much faster than others. Some lamps, again, consume considerably more energy than others, while giving only the same amount of light. There is, however, a certain period in the life of every lamp when, bearing in mind the price charged for energy, it becomes economical to use it no longer. . . . The manufacture during the past twenty years of the ordinary incandescent lamp in which carbon filaments are used, shows that, apart from a few important mechanical improvements, the efficiency of the lamp has not been greatly increased; and, if the increased voltages now used be taken into account, has even somewhat diminished."

Mr. Gaster then proceeds to speak of the promise of those lamps in which a departure has been made from carbon as the incandescent element, by taking other substances, such as osmium, iridium, the rare earths (*i.e.*, a combination of zirconium and yttrium), or by using metal vapours, as in the mercury-vapour

lamp, or rare metals, as in the tantalum lamp; and then says: "In this country the largest percentage of the total electric energy generated is used at present for lighting purposes, and, seeing how utterly unsatisfactory, from a scientific point of view, is this conversion of electric energy into light, the conclusion is inevitable that the whole subject deserves most careful study and investigation. . . . Although, no doubt, there are several improved lamps now on the market, they can each and all be much improved upon if certain problems can be solved. The relative merits of one lamp *versus* another are bandied about with such freedom, and the results obtained by testing even one and the same lamp are so utterly at variance, that it is difficult to know to which statement most weight should be attached. . . . Under present conditions, the same lamp tested by different investigators will give varied results, either on account of the different systems of photometry used, or because the standards of light for comparison are not the same in each case." From the pen of an electrical engineer, this is all highly interesting.

It appears that we are not to be favoured with any detailed account of the performances establishing the merit of the electrical cooking apparatus which entered the competition at the recent Electrical Exhibition at Olympia. The Judges have taken the safe course of giving gratification to all the competitors by splitting up £100 between the firms. Messrs. Veritys, Limited, have received £50, the British Prometheus Company, Limited, £20 and £10, and the Dowsing Radiant Heat Company, Limited, £20. May we express the hope that these windfalls will not be wasted.

WATER ACTS FOR 1905.

In the three preceding "Journal" issues the chief features of the Gas Acts of the past session have been noticed. We now deal with those relating to water supply—taking first the Acts obtained by Companies.

The Brompton, Chatham, Gillingham, and Rochester Water Company are authorized to construct additional works, consisting of two wells and pumping-stations, a covered service reservoir, and a conduit or pipe-line connecting it with one of the new pumping-stations; also to utilize any underground springs which can be collected by means of these works. The period for the compulsory purchase of lands is three years; but no time is specified for the completion of the scheme. The Act contains a series of provisions for the protection of the property vested in the Secretary of State for War; one being that all pipes on such property are to be laid at a depth of not less than 30 inches from the surface of the ground. In the Bill, application was made for power to raise £108,000 of additional capital, inclusive of premiums; and this has been granted. If it is issued as ordinary capital, the dividend is limited to 7 per cent.; if as preference, to 6 per cent. The holders of the latter are not to be entitled to vote. The new shares or stock must be submitted to auction or tender; and what is not so disposed of may be offered to shareholders, employees, or consumers. The Company may borrow to the extent of one-third of the amount of the additional capital authorized. [*Messrs. Dyson and Co., Parliamentary Agents.*]

Neighbours of the above-named Company—the Higham and Hundred of Hoo Water Company—have obtained power to raise additional capital to the amount, including premiums, of £18,000, to be issued in £10 shares or as stock, and the dividends are to be limited to 6 or 5 per cent., according as the new capital is raised as ordinary or as preference. It is, of course, to be put up to auction or tender, and what is not sold may be disposed of by the Directors to the shareholders at a price not less than the reserve put upon that previously offered. Borrowing powers to the extent of one-third of the additional capital are granted. The Act contains provisions for the detection and prevention of waste, and for the laying of pipes in undedicated roads; and certain provisions of the Companies Clauses Consolidation Act, 1845, with respect to the capital and shares, are incorporated in the Act. [*Messrs. R. W. Cooper and Sons, Parliamentary Agents.*]

The Act obtained by the Rhymney and Aber Valleys Gas and Water Company to enable them to raise further capital, and treat the two branches of their business as one undertaking, is the result of the promotion of an emergency Bill, which was allowed to proceed by a suspension of the Standing Orders. The measure was fully noticed, under Gas Acts, in the "Journal" for the 17th inst. [*Messrs. W. & W. M. Bell, Parliamentary Agents.*]

The Skegness Water Act incorporates a Company to take over the private water-works of the Earl of Scarborough, and supply water within the parish and urban district of Skegness, the parish of Winthorpe, and part of the parish of Croft, in Lincolnshire. In the Bill, capital to the amount of £37,500 was sought; but only £30,000 has been granted (to be issued in £5 shares), with borrowing powers to the extent of one-third. Authority has been given to construct a pumping-station, a covered service reservoir, and two conduits or pipe-lines—both commencing at the pumping-station, but one terminating at the reservoir, and the other at the existing water-tank in the parish of Winthorpe. The machinery at the pumping-station is to be in duplicate; and the works are to be completed within three years from the passing of the Act. This is two years less than the Company asked for in their Bill. When the Company are in a position to deliver water from the pumping-station into the existing tank, the present source of supply is not to be utilized for domestic purposes, unless they are compelled by accident to do so. Until the pipe-line connecting the reservoir and the existing water-tank is completed, the charge for water is not to exceed £6 10s. per cent. on the gross estimated rental of the premises supplied; but after that it is to be 8s. 8d. per annum for houses under £5 gross estimated rental, and from 10 down to 8½ per cent. on rentals up to £100 per annum. The Company are not to be compelled to supply water for any less sum than 8s. 8d. in one year, or for a shorter period than twelve months. The charges for baths and closets are set out in the Act. Water supplied by meter is to be at a rate not exceeding 1s. 6d. per 1000 gallons. The Company may sell or let meters, and keep them in repair. Power is given to the Skegness Urban District Council to purchase the undertaking on conditions specified; but they must apply to Parliament within three years from the passing of the Act. Failing agreement as to price, this is to be determined by an arbitrator, whose procedure is defined. The Act contains provisions for the protection of the Spilsby Rural District Council, the Commissioners of Sewers for the County of Lincoln, and the Great Northern Railway Company. [*Messrs. Sherwood and Co., Parliamentary Agents.*]

The portion of the South Oxfordshire Water and Gas Act which relates to gas supply has already been dealt with (see *ante*, p. 107). It therefore now only remains to refer to the sections which bear upon water supply. As previously mentioned, the Company who have obtained the Act have hitherto carried on their operations under the title of the Thames Valley and Goring Water and Gas Company, Limited; and their undertaking is vested in the new body. The water capital consists of £175,000 (comprising £8000 authorized by Provisional Order in 1888, and bearing 10 per cent. dividend, and a like sum sanctioned by another Order issued in 1902 and bearing 7 per cent., and £38,000 granted in the following year), which is called in the Act the "original water capital," and £121,000 of additional capital. This may be raised by the issue of ordinary or preference shares or stock; but not more than half of the water capital is to be preference. The dividend on the 1888 capital is limited to 10 per cent., and on the rest to 7 per cent. if ordinary, and 6 per cent. if preference. Borrowing powers to the extent of one-third are granted. The Company are authorized to maintain and renew their works; and they are not required to supply water at a pressure greater than can be afforded by gravitation from their service reservoir on Greenmoor Hill. Within five years from the passing of the Act, however, they are to supply water, subject to the provisions of section 35 of the Water-Works Clauses Act, 1847, to every part of their district situated above the level of that reservoir. The rates to be charged for a domestic supply of water, as well as for baths and closets, are set out; the charges being higher for supplies above a certain level. Water required for agricultural or trade purposes is to be sold by meter, at a rate not exceeding 2s. 6d. per 1000 gallons; this price to be subject to revision by the Local Government Board after a period of ten years. Water may be sold in bulk within or beyond the limits (in the latter case by consent); but it must not be distributed for consumption outside the counties of Berks and Oxford. Bye-laws may be made for the prevention of waste. The Company are authorized to sell meters and keep them in repair, and also to supply fittings and materials. The accounts of the water undertaking are to be kept separate from the gas accounts. [*Messrs. Sherwood and Co., Parliamentary Agents.*]

The Truro Water Act confers upon the Truro Water Company power to construct additional works, consisting of a conduit or pipe-line at their existing pumping-station, and terminating in a new covered service reservoir in the parish of St. Clement. Land to be taken compulsorily for the works must be acquired within three years from the passing of the Act, and the works themselves are to be completed within five years. Authority is given for the raising of additional capital not exceeding £22,900, the dividend on which is limited to 7 or 6 per cent., according as it is issued, as ordinary or preference. The new stock is to be offered in the usual way. Borrowing powers to the extent of one-fourth of the additional capital are sanctioned. The Company may sell water by meter, at a price not exceeding 1s. 6d. per 1000 gallons; and they may sell or let meters. Persons injuring them or the pipes or fittings, or fraudulently abstracting water, are to be liable to a penalty not exceeding £5, *plus* the amount of the damage sustained. If the Corporation of Truro introduce a Bill in the next or the succeeding session to empower them to purchase the Company's undertaking, the Company are not to oppose, except so far as may be necessary to secure protective provisions. [*Messrs. Torr and Co., Parliamentary Agents.*]

The Western Valleys (Mon.) Water and Gas Act, as explained when dealing with the Gas Acts (see *ante*, p. 163), has been obtained to allow of a re-arrangement of the capital and the amendment of the borrowing powers of the Western Valleys Water and Gas Company. The two undertakings, instead of being separate, as they were under the Company's Acts of 1891 and 1892, are henceforth to be treated as one. The original capital is put down at £60,000, and the Company may raise and expend any balance of unissued capital not exceeding £20,280. In respect of the first-named amount, they may borrow up to £15,000; but no further part is to be borrowed until 50 per cent. of the value of the shares or stock issued at the time (inclusive of any premium)

shall have been paid up. All money borrowed is to be a charge upon the combined undertaking, notwithstanding anything to the contrary contained in either of the above-named Acts. The dividend on the ordinary capital is put at 10 per cent.; and that on the preference capital at 5 per cent. [*Messrs. W. & W. M. Bell, Parliamentary Agents.*]

THE "STRONCO" MANTLE.

In view of the great development which has taken place in incandescent gas lighting during the past decade, it is quite unnecessary at this time of day to dwell upon its advantages, whether for private or for public lighting, as they have now been fully recognized. The marvellous change in our system of illumination which Dr. Auer von Welsbach's invention brought about has necessarily led to an enormous demand for mantles; and it has been met from various quarters. The desire to popularize the new system had for one result the flooding of the market with articles which, while commending themselves to consumers on the score of cheapness, possessed the other quality usually, and only too justly, associated with it. The effect of this, as was pointed out by one of the speakers at the recent opening meeting of the Wales and Monmouthshire Institution of Gas Engineers, has been, in many cases, to disgust consumers, and cause them to revert to the old flat-flame burner. Gas companies have consequently had to take the matter into their own hands, and exercise some sort of supervision over both mantles and burners. There is nothing more unsightly, or more detrimental to the progress of the incandescent system of gas lighting, than defective mantles in operation; and, unfortunately, they are not unfrequently to be seen both in this country and on the Continent—a fact of which our friends the electricians are not backward in taking note.

The fundamental qualities of good mantles are high light-production and durability; and these are only to be obtained by careful attention in manufacture. For example, in the production of the fabric which is the base of the mantle, a change from the customary method of weaving may make a vast difference in its "life." Such a change has been made in the "Stronco" mantle, which is introduced by Messrs. Julius Norden and Co. In the ordinary mantle, the webbing is horizontal, whereas in the "Stronco" it is perpendicular; that is to say, the web opens from top to bottom instead of across the mantle. The advantage claimed for this method of weaving is primarily increased durability, as the mantles can be made of an average length of 5 inches, which gives a large area of incandescence; and, secondly, greater fluid-absorbing capacity. After deducting the weight of the asbestos loop, each one of these mantles has been found to contain a mean of 0·71 gramme of oxide of thorium and cerium. They have been tested for light-emitting quality by an eminent photometrist, who found that, used on a good "C" burner, they gave, with a consumption of 4 cubic feet of gas burnt at a pressure of 15·10ths, 98 and 100 candles, or at the rate of 24·5 and 25 candles respectively per cubic foot. The same gentleman conducted some tests to ascertain the powers of endurance of the mantles; the consumption of gas and the pressure being as before. After 24 hours' burning, they gave the light of 100 candles; after 144 hours, 90·8 candles; after 528 hours, 84·5 candles; and after 600 hours, 78·6 candles. According to these figures, the "Stronco" mantle retains its light-emitting power for a considerably longer period than an ordinary cotton mantle, which at the end of 600 hours has, as a rule, fallen to about 10 candles per cubic foot of gas consumed, while in this case upwards of 19 candles per cubic foot were being given after this period of burning. The makers, however, are not satisfied that this is the best duty of which the mantle is capable; and they are expecting to obtain results 25 per cent. better than those above quoted. Such is their confidence in the "Stronco," that they are prepared to guarantee a yield of more than 100 candles, with a consumption of less than 4 cubic feet of gas, over 2000 hours' burning—a record economy of 1·7th of a penny per hour and 1·700th of a penny per candle.

The Midland Junior Gas Engineering Association will meet next Saturday afternoon, at the City of Birmingham Technical School. The President (Mr. F. J. Bywater) will deliver his address; and afterwards Mr. W. S. Smart will read a paper on "Structural Steel Work for Gas-Works."

We have received from Messrs. Emmott and Co., Limited, the "Mechanical World" Pocket Diary and Year Book for 1906. This is the nineteenth issue of this useful collection of engineering notes, rules, tables, and data; and in its preparation an exceptionally large amount of new matter (much of it pertaining to branches of engineering practice which are becoming increasingly important) has been introduced. One section contains a succinct account of the steam-turbine in its various forms, together with practical data and information on the subject. Additions have been made to the sections dealing with gas and oil engines. Among other new matter will be found two tables on screw-threads, and tables relating to the strength of crane chains, shaft bearings, the weight of bolt-heads, &c. The diary portion is arranged for a week on a page. The book is bound in cloth, and the price is 6d.

COAL STATISTICS FOR 1904.

A Record Output.

The Home Office report and statistics relating to the output and value of the minerals raised in the United Kingdom last year (issued a few days ago in the form of a Blue-Book, as Part III. of the Report on Mines and Quarries), supplies, as usual, very full details regarding the prime necessity of gas managers—coal. To begin with, there is the interesting information that the total output of coal in 1904 was the highest hitherto recorded—232,428,272 tons, or 2,093,803 tons more than in the preceding year. But in spite of this increased production, the lower prices realized made the value £83,851,784, against £88,227,547 in 1903. Thus, with an increase of more than two million tons of coal, there was a falling off of over four million pounds in value, owing to a reduction in the average price of coal at the pit from 7s. 7·93d. per ton in 1903, to 7s. 2·58d. in 1904.

The increased output last year was shared by England, Wales, Scotland, and Ireland; but the largest proportion fell to Wales, where the increase stated is 847,184 tons on a total output of 35,514,079 tons, as against an increase in England of 783,195 tons on a total of 161,355,167 tons. Scotland, with a total close upon that of Wales, shows an increase, compared with 1903, of only 460,599 tons. As already remarked, prices were not at all unfavourable to buyers during the period under review—in fact, in the case of English coal they were the lowest since 1898, in that of Welsh coal since 1899, and in that of Scotch coal since 1897. The average prices per ton at the pit's mouth during the past five years have been: England—1904, 7s. 1d.; 1903, 7s. 7d.; 1902, 8s. 1d.; 1901, 9s. 1d.; 1900, 10s. 6d. Wales—1904, 9s. 2d.; 1903, 9s. 6d.; 1902, 10s. 7d.; 1901, 11s. 11d.; 1900, 12s. Scotland—1904, 5s. 11d.; 1903, 6s. 3d.; 1902, 6s. 8d.; 1901, 7s. 11d.; 1900, 10s. 10d. The average prices per ton in the London market over the same period were: 1904, 15s.; 1903, 15s. 10d.; 1902, 18s. 1d.; 1901, 19s. 5d.; 1900, 22s. 9d.

The quantity of coal exported during 1904 also constitutes a record. The amount, exclusive of coke and patent fuel and of coal shipped for the use of steamers engaged in foreign trade, was 46,255,547 tons, as compared with 44,950,057 tons in the preceding year; the declared value being £25,491,414, against £26,036,303. Adding the 2,375,588 tons exported in the form of coke or patent fuel, and the 17,190,900 tons shipped for the use of steamers engaged in foreign trade, the total quantity of coal which left the country last year was 65,822,035 tons. The declared value of the exports of coke was £574,309, and of the patent fuel £796,663. Of the quantity of coal exported, three countries — Germany, France, and Italy — took over 6,000,000 tons each; while 160 tons went to Australia. The coal, culm, and cinders imported into the United Kingdom is always a negligible quantity; and last year it was even smaller than in 1903—2768 tons, compared with 3479 tons, the value of which was £2689, against £3987. In return for the enormous quantities exported to those countries, we received from Germany about half the total imports (1332 tons), from France 13 tons, and from Italy 21 tons. The amount sent over from the Atlantic ports of the United States has reached vanishing point—it having been only 14 tons in 1904. The quantity of coal utilized for the satisfaction of home requirements was 166,606,237 tons, or a fraction under 4 tons per head of the population; and of this 17,535,337 tons was employed in blast furnaces for the manufacture of pig iron. Anthracite is, as usual, included in the coal statistics; and the total output of this during the year was 2,962,252 tons. The average quantity of coal raised per person employed underground was 353 tons in 1904, which was an increase of 1 ton over the preceding year.

Among many other things besides coal which are mentioned in the report there is, of course, natural gas; but this is not the source of any great addition to the country's wealth. So far Heathfield, in Sussex, alone enjoys the distinction of supplying natural gas; and the output there seems to be altogether incommensurate with the fuss that has been made over it. During the year 1904, the amount obtained was no more than 774,800 cubic feet, and was valued at £155. Petroleum is another commodity which has never been obtained in any large quantity in Great Britain. A little has been during recent years secured in North Staffordshire and Yorkshire; but none at all has been yielded since 1902, when the quantity was 25 tons, of a value of £60. The highest figure recorded was in 1893, when there was a yield of 260 tons, having a value of £488.

Of a very different character, of course, are the statistics relating to the imports of petroleum into this country. A return by the Board of Customs gives the following quantities (in gallons) as having been received from various sources in 1904—the value being added in parentheses: Russia, 129,599,066 (£2,120,955); the United States, 151,159,632 (£3,295,593); and other countries, 21,372,445 (£422,485). For 1903, the figures were: Russia, 133,391,823 (£1,892,207); the United States, 133,347,898 (£3,025,767); and other countries, 19,122,912 (£377,377). The total quantity imported last year was 302,131,143 gallons, of a value of £5,839,033, as compared with 285,862,633 gallons and £5,295,351 in the preceding twelve months, 284,809,710 gallons and £5,193,582 in 1902, and 253,784,746 gallons and £5,070,702 in 1901.

NEW GASHOLDER FOR SHEFFIELD.

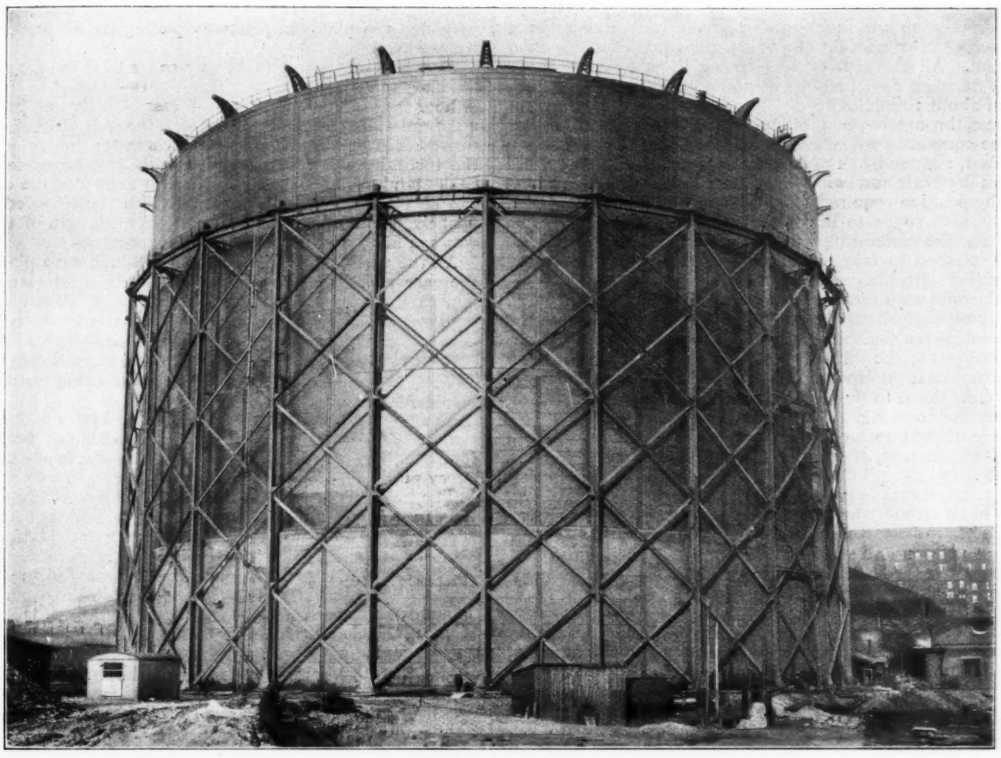
THE Sheffield United Gaslight Company have recently constructed at their Neepsend works one of the largest gasholders in the country. We think we are right in stating that the capacity of it is only exceeded by four larger holders in the world; for, when fully inflated, it will contain 8,113,600 cubic feet of gas, with a working capacity of 7,706,000 cubic feet. Prior to bringing the new holder into use, the total of the Company's storage was 13,800,000 cubic feet—contained in ten holders, varying in capacity from 1,865,000 cubic feet down to 645,000 cubic feet. The Company have, therefore, now means of storing upwards of 21,500,000 million cubic feet.

The largest consumption of gas in Sheffield in twenty-four hours increased from 11,541,000 cubic feet in 1895 to 15,138,000 in 1897, to 16,115,000 feet in 1901, and to 18,285,000 feet in 1904; so it will be seen that, for the management, the new holder is a most welcome addition. The Company very wisely deferred placing the contracts for the tank and holder at a time when the prices for material and labour were abnormally high—preferring temporary to pay a little more in working expenses. They, therefore, waited till the boom in trade of a few years ago had passed, and have now been able to carry out the work at a very reasonable figure indeed.

By the courtesy of the Engineer—Mr. John W. Morrison—who has designed the work, we propose to publish some drawings and descriptions of the work, which, we feel sure, will be of interest to the whole of the profession.

The site of the new holder adjoins the old works; being divided from it by a road, which was slightly diverted so as to use the ground to the best advantage. It was then decided to build a tank 250 feet in diameter, which left a minimum clearance of 18 ft. 6 in. between the inside of the tank walls and the Company's boundary on the two nearest sides; and to fix the level of the coping of the tank at about 1 foot above the highest level of the surrounding ground, which had a fall of 8 feet from north to south. This necessitated building a strong retaining wall to keep up the embankment between the tank and the roadway.

Bore and trial holes were then sunk within the area of the proposed tank; water being found at an average depth of 26 ft. 6 in., and the hard rock at an average depth of 42 ft. 4 in. below the proposed top of the tank. A sump, 15 feet square at the top and 12 feet square at the bottom, was then sunk 21 ft. 6 in. from the edge of the tank; and this was carried down to the hard rock,



THE NEW SHEFFIELD HOLDER (7¾ MILLION CUBIC FEET CAPACITY) FULLY INFLATED—SEPT. 13, 1905.

which at the point was found at 50 ft. 3 in. below the coping. It was then decided to build the tank so that it would be 44 ft. 6 in. deep when finished, as it was thought that, owing to the contour of the ground, the hard rock would be found at this level throughout the circumference of the tank walls. This assumption, it is satisfactory to learn, was proved during construction to be quite correct.

When the sump was at its full depth, water flowed in at the rate of 1200 gallons per hour; and from this it was anticipated that it would not be much trouble to keep the water well under control during construction.

Drawings and specification were then prepared; and the contract was let to Messrs. John Aird and Sons, who commenced operations in November, 1903. Fourteen months were allowed for carrying out the work; and it is pleasing to chronicle that it was completed six weeks before the allotted time. The contract included excavating and carting away the surplus material (and this had to be taken to a tip about half-a-mile from the site), pumping the water while the work was in progress (including during the building of the gasholder), breaking the stone and rubble, supplying the lime and portland cement for the concrete and rendering all the timbering for the support of the crown of the holder, and fixing the holding-down bolts, inlet and outlet pipes, and tank guides. All the ironwork was provided for the tank contractor by the Gas Company, with the exception of the bond iron.

When Messrs. Aird and Sons began their work, the site was very irregular; and they therefore decided to excavate the ground over the whole area to within a few feet of the finished level of the dumpling. This necessitated forming a slope on the high ground behind the annulus of the tank. A stout baulk was then fixed in a massive block of concrete in the centre of the tank; and this formed the pivot on which the trammel-bar was erected.

The trammel-bar was built up of strong timbers, strutted, braced, and guyed with wire ropes vertically and laterally, and counterbalanced at the short end. It was perfectly rigid in itself, and was easily moved by one man, although it weighed about 10 tons. At the end, a heavy plumbob was suspended from an adjustable thin wire rope; and this was used for striking the 125 feet radius of the tank. [It may here be mentioned that the tank was set out 1½ inches larger in diameter than required, to allow for closing in when the weight of the backing came on the side walls. This was found to have worked out correctly when the tank was finished, as it was practically the exact diameter when completed.] An annular trench was then excavated and timbered in the usual way; the spoil being raised to the level of the top of the cone by steam cranes, which ran on rails laid on the inner circle of the tank. These cranes deposited the excavated material into carts or tip waggons; the pebbles, boulders, and hard rock being kept for breaking into concrete. An inclined railway was laid on to the top of the cone; and the tip-waggons

were hauled up it by means of a winding engine, and then horsed to the tip. This railway was also used for conveying the broken ballast, cement, and sand required for the tank walls. As the excavation of the annulus proceeded, the cross-trench draining the water to the sump was kept at the lowest level; so that all the water met with during the progress of the work found its way to the sump. A drain, consisting of 6-inch sanitary pipes, with open joints and dry rubble packing, was laid at the foot of the tank walls, with six cleaning-out holes equally spaced, to drain all water into the main sump; and these were found to be ample for the purpose for which they were intended. A 12-inch pipe was then laid in the cross-trench, coupling the 6-inch pipes to the sump; and when this was done, the cross-trench was filled in.

For the lower 15 feet of the tank walls, the excavation was made so that the concrete was filled in solid against the side of the excavation. No backing up was therefore required for this depth. The concrete walls were then carried up in layers until they had reached a few feet above the cone; the work being done from the inside of the tank—the inner face of the walls being kept true by means of shuttering. The cranes and rails were then removed to the outside of the tank, and the material taken from the excavation of the slope of the tank was used for backing-up behind the walls, and levelling the surrounding ground, &c.

The portland cement used was supplied exclusively by the Associated Cement Company, from their Arlesley works. It weighed 114 lbs. per striked Imperial bushel, and would pass through a 40 B.W.G. wire sieve containing 5·776 meshes per square inch, without leaving more than 4 per cent. of residue. From repeated tests taken when made up into moulds, after seven days' immersion, it gave an average tensile strain of 540 lbs. per square inch of fractured section. All the cement was stored in waterproof sheds for at least fourteen days before use, and emptied out of the bags in layers of about 12 inches deep. The ballast was broken so that it would pass through a 3-inch diameter ring. All the materials used for the concrete were measured in bunkers, in the proportion of 5 of ballast, 1 of sand, to 1 of cement or ground lias lime, turned twice in the dry state and twice when wetted, then tipped in 9 inch layers in the position required from a height not exceeding 5 feet, and well punned, so as to make the mass homogeneous. The sand used for the concreting was made from ground gritstone; river sand (washed to take out all dirt or loamy matter) being used for mixing with the cement for rendering.

The tank walls were formed of portland cement concrete, and are 5 feet thick at the base and for 15 feet in height, then tapering to 3 feet thick at the top. The slope and top of the cone is made with lime concrete; the thickness varying from 18 inches at the base to 15 inches at the crown. The ground was excavated on the top of the cone down to the gravel, to ensure providing a good bed for the concrete covering.

The whole of the interior of the tank was rendered with ½ inch of one-and-one cement, and finished with a coat of neat cement, ¼ inch thick.

A timber framework is provided for supporting the gasholder crown, having a strongly-braced triangle structure in the centre, and stout butts radiating from it. Their ends are embedded in blocks of concrete; and these carry a framework of 9-inch by 3-inch timbers curved to the correct radius. Fifty-two blow-holes were left in the sides and top of the cone; and these were filled up as the water was put into the tank.

The water in the ground averaging about 26 feet below the top of the coping, a permanent vent pipe, 6 inches in diameter, was fixed in the centre of the cone, and carried up well above the level of the tank coping, so that as the ground water rises or falls, it will not put any undue strain on the concrete surface. During the construction of the tank, the greatest quantity of water dealt with from the excavation averaged 9000 gallons per hour.

The inlet and outlet pipes are 36 inches in diameter. They are of cast iron, except the horizontal portion passing under the tank walls, which is of steel.

Water was turned into the tank on July 24, and the filling was completed by August 28; the contents being over 8¼ million gallons. The work has proved most creditable to all concerned, the tank being absolutely sound—thus adding another testimonial to the long list of engineering works carried out by Messrs. John Aird and Sons.

The cost of the tank complete—including sump, timber framework, inlet and outlet pipes, tank guides, stone for concrete, and tip charges—was £26,618; and this amount divided by the working capacity of the holder equals £3 9s. 1d. per 1000 cubic feet.

The contract for the gasholder was secured, in open competition, by Messrs. Samuel Cutler and Sons, of London, in June, 1904. They commenced the erection in January, 1905, and completed the work so that the inauguration of the holder took place last Friday.

The gasholder has four lifts—the inner one rising clear of the standards; and, when fully inflated, it will reach a height of 166 ft. 6 in. from the bottom to the top curbs. The crown, which is untrussed, rises a further 18 feet. The dimensions of the lifts and their respective weights are as follows :—

Inner lift . .	239 ft. 0 in. diameter, 42 ft. 6 in. deep . .	418 Tons.
Second ,, .	241 ,, 8 ,, ,, 43 ,, 6 ,, ,, . .	233 ,,
Third ,, . .	244 ,, 4 ,, ,, 43 ,, 3 ,, ,, . .	223 ,,
Fourth ,, . .	247 ,, 0 ,, ,, 43 ,, 6 ,, ,, . .	234 ,,
Weight of tank guides and guide framing		803 ,,
	Total weight =	1911 Tons.

In designing the holder, standard sections of material were used throughout the work; mild steel being employed exclusively, with the exception of the cast-iron standard bases.

The steel used throughout the work was of British manufacture, and had to stand a tensile strain of 27 to 31 tons per square inch, with not less than 20 per cent. elongation. The rivets and bolts were tested to 30 per cent. elongation in a length of 10 inches. All the tests were well maintained.

Extra care was taken to prevent any of the material rusting during construction. It was kept coated with boiled oil as often as necessary, and when completed it was painted with pure red-lead paint, and afterwards finished with red oxide. There is no part of the framework where water can lodge that is inaccessible for painting (the covered portion of the joints, of course, excepted).

All the rivets above ⅜-inch diameter were put in hot by hydraulic or pneumatic power; and every bolt or rivet hole for the attachments on the standards, was broached out by pneumatic drills, so as to ensure the holes being perfectly true. The holes in the strong plates and angles were all drilled to templates; and the plates were caulked by pneumatic tools. In every case, full-sized templates were made of the joints and attachments, showing the holes in them, before the work was proceeded with.

The framework consists of 28 plate standards 131 feet high, braced together with five tiers of strong built T section diagonal bracing. These are available either as ties or struts, and are held together at the top of the standards by a solid-plate girder, on which is a platform plate completing the circumference of the framework.

As it was impossible to fix guy-ropes to the sheer legs used for erecting the standards and framework—owing to the proximity of houses and other buildings—Messrs. Cutler and Sons designed a special back member for the legs, the foot of which rested on a turntable erected on timber supports in the centre of the crown; the turntable itself being guyed with wire ropes to the base of each standard, and the upper end attached to the crosshead of the sheer legs. In this way, the legs were moved round the framework on rollers, as required. The length of this back leg was 174 feet; and it was made in six sections.

All the vertical stiffeners, and the 18-inch strip plate on which they are riveted, are made in one length, and extend from the cup to the grip plate—averaging about 38 ft. 6 in. long. The holder side-sheets, it will also be seen, are much larger than usual; the average size being 12 ft. 6 in. by 3 ft. 4 in., and two plates in length only being required between each standard. The amount of rivetting is thus reduced; and a very good appearance is given to the structure.

The cups and grips are 21 inches deep by 10¼ inches wide; and they vary in thickness from ½-inch on the inner lift, to ⅝-inch on the outer lift. The grips are provided with rest-blocks, one to every plate.

The holder is provided with two sets of Messrs. Cutler and Sons' "anti-freezing" apparatus, fitted to the cups of the first and second lifts; also the necessary ladders and platforms to gain access to these and the top of the holder.

The cost of the holder and framework was £26,393. This works out at £3 5s. per 1000 cubic feet of the total capacity—equalling £3 8s. 6d. per 1000 cubic feet of the working capacity. It will be seen, therefore, that the total cost of the gasholder and tank complete was £53,011.

Gas was turned into the holder on the 27th inst., and the holder was brought into use at that date. It is a pleasure to state that Messrs. Cutler and Sons carried out the design most satisfactorily, and spared no trouble or expense to ensure first-class work being done.

The Inauguration of the Holder.

On the invitation of Mr. Morrison, a few gas engineers and friends were present last Friday to witness the inauguration of the new holder; and after Mr. Morrison had explained to those present the necessity for such a large holder being erected, and had given a few dimensions and particulars of the tank and holder, Mrs. Morrison was asked to release tricoloured ribbons and a gold curb which sealed the inlet valve. This she did very graciously, and the valve was opened.

As the holder began to rise, Mrs. Morrison said that, after two years of hard work, it was very satisfactory to all concerned that their labours had been brought to so successful an issue, and that she hoped the holder would add further success to the Sheffield Gas Company, and prove a welcome addition to the storage for the management.

Mr. Samuel Cutler, sen., thanked Mrs. Morrison for taking a prominent part in the proceedings that day. He said it had been a great pleasure for his firm to carry out work of such magnitude for the Sheffield Gas Company; and he wished to thank the Engineer, Mr. Morrison, and the Clerk of the Works, Mr. W. A. Valon, jun., for the kindness and courtesy shown to his firm. He felt sure the Company had a structure second to none in the country.

Mr. T. H. Waterhouse, one of the Directors of the Gas Company, congratulated Mr. Morrison on having completed so splendid a piece of engineering, and said he had watched the progress of the work from its commencement, and was entirely satisfied that everything had been well done.

A photograph of those present was then taken, and, after viewing the holder, they adjourned to the governor-house, where refreshments were provided.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Autumn Meeting of the Association was held last Thursday, at the Grand Hotel, Birmingham. The PRESIDENT (Mr. Thomas Berridge, of Leamington) was in the chair; and the attendance was exceptionally large. The visitors included the President of the Institution of Gas Engineers (Mr. Charles Wood, of Bradford), Mr. J. W. Helps, of Croydon, Mr. Edward Allen, of Liverpool, Mr. Douglas H. Helps, of Reading, and Dr. Colman, of London.

CONFIRMATION OF MINUTES.

The HON. SECRETARY (Mr. Charles Meiklejohn, of Rugby) read the minutes of the meeting held on the 18th of May at Leamington; and they were confirmed.

WELCOME TO VISITORS.

The PRESIDENT said he should like to express the appreciation of the members at the kindness of the President of the Institution of Gas Engineers in being present at their meeting, and to give him, in their name, a cordial welcome. He also wished to say how pleased they were to see other friends present—including Mr. James W. Helps, Mr. Allen, Mr. D. H. Helps, and others too numerous to mention.

ELECTION OF NEW MEMBERS.

The HON. SECRETARY said there were two new members to elect —Mr. Samuel Glover, of St. Helens, and Mr. W. Chaney, the Manager of the Nechells works of the Birmingham Corporation. The nomination of these gentlemen was unanimously endorsed.

ELECTION OF OFFICE-BEARERS.

The PRESIDENT proposed that Mr. Fletcher Stevenson, of Coventry, be elected President of the Association for the year commencing in February next.

Mr. W. R. COOPER (Banbury) seconded the motion; and it was unanimously carried.

Mr. STEVENSON thanked the members very much for the honour they had done him. He felt he was unworthy of it; but to the best of his ability he would fill the chair, and do all in his power to forward the interests of the Association in every possible way. He hoped he might be successful.

The PRESIDENT said he had next the honour to propose Mr. J. H. Brown, of Nottingham, as the Vice-President. Mr. Brown was favouring them with a paper on this occasion; and he had been a frequent attendant at their meetings. He would make an excellent President when the time came for him to pass to the chair.

Mr. GEORGE HELPS (Nuneaton), in seconding, said that most of the members were acquainted with the original work of Mr. Brown; and he did not think they could have a better man to fill the Vice-Presidency and ultimately the Presidency.

The motion was cordially agreed to.

Mr. BROWN said he was deeply indebted to the members for the honour they had conferred upon him; and he could assure them that nothing should be spared on his part to make the Association and its meetings a success.

Mr. W. NORTH (Stourbridge) remarked that it was certainly a great pleasure to him to propose that his old friend Mr. Cooper be elected Hon. Treasurer. They had been associated so many years that, when they met, it always reminded them of old times and old friends, many of whom had departed. It would be a pleasure to him (Mr. North) and to the whole of the members, to see Mr. Cooper continuing in this office.

Mr. B. W. SMITH (Walsall) observed that it was a pleasure to him to second this resolution, especially as Mr. Cooper had been with them so long, had taken such an interest in the Association and its meetings, and had so well guarded the purse.

The motion was heartily passed.

Mr. COOPER briefly acknowledged the renewal of the confidence of the members.

The PRESIDENT next proposed the re-election of the Hon. Secretary (Mr. Charles Meiklejohn).

Mr. FLETCHER STEVENSON, seconding, said he was convinced they could not have a better Secretary than Mr. Meiklejohn.

The motion was heartily carried.

The HON. SECRETARY thanked the members by saying that, so long as they did not tire of electing him, he did not see any prospect of his tiring in the office to which they had been good enough to elect him.

The PRESIDENT said the two Auditors were Mr. W. S. Moreland, of Gloucester, and Mr. Vincent Hughes, of Smethwick. In this Association, it was the custom to elect their Auditors to the Committee; and they could not do better than pass these gentlemen on to the Committee. He proposed accordingly.

Mr. A. COOKE (Oldbury) seconded the proposition, which was unanimously adopted.

Mr. MORELAND, in reply, said he thanked the members very much for having done him the honour of electing him a member of the Committee. He had not been a member of the Association for a great length of time; but that was all the more reason why the confidence of the members would urge him to do his best to further its interests.

The PRESIDENT said the Committee suggested, and he proposed, the election of Mr. F. Lee, of Hinckley, and Mr. A. T. Harris, of Market Harborough, as Auditors.

Mr. W. A. SAPEY (Tamworth) seconded the motion, which was unanimously carried.

A NOTICE OF MOTION.

Mr. SMITH said he wished to give notice of a motion for the annual meeting next February, providing for the alteration of Rules Nos. 3 and 4, to the effect that the President, Vice-President, Treasurer, and Secretary should be elected annually; that two members of the Committee should retire annually by rotation; and that all these officers should be elected by ballot—a balloting paper to be sent by post to each member of the Association at least seven days before the annual meeting. He should hand to the Hon. Secretary the three signatures of members authorizing the matter to go forward.

The HON. SECRETARY asked to be allowed to suggest to Mr. Smith that he would have to alter the terms of the resolution for it to have the effect intended. The seven days before the annual meeting would be three months after the election took place.

The PRESIDENT observed that they could alter the rules in February, but it would apply to the October meeting.

The HON. SECRETARY pointed out that the motion should read seven days before the October meeting, not seven days before the annual meeting.

Mr. SMITH observed that he would make the necessary alteration.

DEATH OF LORD LEIGH.

The PRESIDENT said the next resolution he had to submit was rather a sad one. The members knew that their much respected Lord-Lieutenant of the county, Lord Leigh, passed away early in the week. He was being buried at Stoneleigh that day. A memorial service had also been held in the Cathedral Church of Birmingham; and it had only concluded a few minutes before their meeting. As the Association had on several occasions received kindness from Lord Leigh, by being permitted to walk and drive through his beautiful parks, and in view of the character of the man—no one had lived a nobler, kinder, or better life than he, no one was more willing to help forward any charitable purpose, and no one was more ready to do his part in the best affairs of this life—they, as an Association, could testify their sympathy and regard. He therefore begged to move "That the Midland Association of Gas Managers much regrets the death of Lord Leigh, and desires to send a respectful letter of sympathy with the members of his Lordship's family."

Mr. T. GLOVER (Norwich) seconded the motion, which was carried by the members silently standing.

A MESSAGE OF SYMPATHY WITH MR. PARLBY.

The PRESIDENT next proposed that a resolution of sympathy with Mr. Parlby be passed, in the unfortunate circumstances in which he had been placed. He was an honoured colleague; and they each one desired to send him a message of sympathy.

Mr. S. O. STEPHENSON (Tipton), in seconding the motion, said the members all deeply sympathized with Mr. Parlby. He had given the best years of his life to the work at Hereford. In the 21 years he had been there, the price of gas had been reduced from 4s. 6d. to 2s. 6d. per 1000 cubic feet, and something like £80,000 of the capital had been paid off. It seemed to him (Mr. Stephenson) that it was a very small matter that Mr. Parlby was asked or got to resign upon. It was the laying of 6 miles of mains, which it was contended had not been laid satisfactorily. This seemed to have been doubtful, seeing that, from what they understood, a steam-roller was running over the track soon afterwards. The leakage from this 6 miles of mains only amounted to 2 per cent. Had a vote of censure, if deserved, been passed upon Mr. Parlby, it would have been quite sufficient, without asking him to retire from his position. It was not a matter upon which they could say much. He had a delicate feeling about cases of this sort. But he thought a vote of sympathy from the Association would certainly be very gratifying to Mr. Parlby; and it might possibly have the effect of inducing his Committee to think more soberly over the matter, and hesitate before they got rid of a good officer who had served them well.

The resolution was then put and carried.

A NEW SOURCE OF INCOME FOR GAS-WORKS.

The PRESIDENT said the next matter had reference to a new source of income for gas-works. In Berlin and other large Continental cities, there was in use a system of synchronizing clocks by electricity. It had been found that this could be done much better by gas; and there was an idea of turning out the electric current and replacing it by gas. The Electric Synchronizing Clock Company found that, while they could synchronize the clocks by reducing the power of the current by 25 per cent., in Leamington and Birmingham the electricity suppliers could not take on the order because they found, if they reduced the strength of the current by 25 per cent., it stopped the printing-presses, the hotel lifts, and injured the Nernst lamps. The Company approached him (the President), and asked whether the Gas

Company could give them an increased pressure—say, of about 1½ inches, at any time for five minutes in the twenty-four hours. He saw no difficulty in doing so; and they successfully instituted the method of synchronizing the time at 3 o'clock in the morning, by mechanism attached to the governors temporarily increasing the pressure by 1½ inches. This put all the clocks that were in connection with the system correct all over the town. The Clock Company were willing to pay the Gas Company a fee of 5s. a year for each clock attached. They put on the increased pressure mechanically, without any trouble to the Gas Company. It had not been long in use; but in places like Birmingham and London many thousands of clocks might be got out. The clocks were rented at a price of two guineas a year. In London, the correct time clocks were three guineas. They had there to adopt that price, because they had to have a separate electric wire all round; but it could be reduced to two guineas if gas was the means used. It seemed to him (the President) that this was a question they might inquire into; and he moved that—"The President having reported what was being done in Leamington in synchronizing the clocks there by raising the gas pressure by the Synchronized Electric Clock Company, the matter be referred to the Investigation Committee to inquire into, and report upon at the next meeting."

Mr. T. GLOVER (Norwich) said he had had the pleasure of seeing this method of synchronizing clocks, and had gone into the matter a little with the President and the patentee; and he certainly thought it was well worth investigating. It sounded very novel. There was no doubt it could be done; and that it was worthy the attention of gas engineers.

The motion was unanimously agreed to.

THE PAINTING OF GASHOLDERS.

At the May meeting (see "JOURNAL," May 23, p. 500), a paper was presented by Mr. HENRY FOWLER (Derby) on "The Painting of Gasholders." It now came forward for

Discussion.

The PRESIDENT said the next business on the *agenda* was the discussion of the paper Mr. Fowler submitted to the members at the Leamington meeting. As would be remembered, it was a very interesting paper—the subject being the painting of gasholders. It was of the type of paper that would do the members good, as an Association, if they had more of them. He was pleased to tell them that Mr. Archbutt, who conducted the experiments jointly with Mr. Fowler, was also present. The only thing that occurred to him was as to whether they adopted any different method of getting rust off the old gasholders than the sand blast, electric brush, or something of that sort.

Mr. W. C. JONES (Brierley Hill) said he had read the paper with great care, to see whether his practice differed materially from that adopted by Mr. Fowler. He might say that about three years ago he had to re-sheet the middle lift of his large holder; and the question then arose as to the best method of treating the sheets before they left the manufacturers' works, and also after they had put them together. After consideration, he came to the conclusion that the best method to deal with them was to receive the plates from the manufacturers, and to remove all mill scale. This was rather different from what Mr. Fowler recommended; or rather what he suggested was that, if they could get the plates without the scale being broken, that was the best condition in which to have them. Undoubtedly it would be so; but the process of punching the plates and their testing tended to break the scale. Therefore in his opinion the best thing they could do was to remove the scale remaining on the plates. He decided that he would use red lead, and raw and boiled linseed oil in the proportions of about half and half, and after they had stippled it on, they applied oxide paint over the top. He had very carefully scanned the sheets treated by this method. He found the red lead was adhering very closely to the iron; and there was no sign of rust taking place. At the same time, he painted a certain number of sheets with graphite. He had scraped away the paint; and he found underneath that it looked just as though it had been blackleaded, and the iron was preserved very well indeed. He was quite satisfied in his own mind that red lead if properly applied to iron, without cracks or dampness on the iron, was one of the very best of preservatives they could have in conjunction with a covering of oxide of iron. Regarding graphite, it seemed to him that for painting in gas-works they depended upon unskilled labour. They did not usually employ those who were used to it; and the graphite paint was easily applied by those who did not know anything about painting. It worked easily; and the paint that worked easily was one that was applied in the best manner. He thought it was possible that the graphite paint might set quickly—more so than red lead and oxide. He had this year practically re-sheeted another gasholder; and he had used nothing but graphite paint—giving the holder a first coat of graphite paint inside and out. This was unusual; but he had come to the conclusion that a coating of paint on the inside of a holder was an important advantage. Reverting to the question of mill scale, he said he had found that, if it was not removed, it simply remained on for a few years, and then dropped off—bringing with it the paint that was on the top of the scale.

Mr. CHARLES WOOD (Bradford) said he had taken considerable interest in this subject for a very long time. Perhaps if he gave the members an illustration from the experience at Bradford, it would be well. At one of his works he had six gasholders, and they were practically of equal size—120 feet holders of three lifts. Some years ago, one lift of one of the holders got into a very bad state indeed; and they were never able to prove exactly why this particular one should have got so much worse than the others. It was pitted nearly all over. They tried on that particular holder, he thought, every paint on the market as a preservative; and, in fact, they experimented upon it for a great many years. The conclusion he came to agreed to a great extent with that of the last speaker. He was firmly of opinion that the best protective material for any ironwork was red lead, and most decidedly not oxide of iron paint. He thought there was only one thing worse than that, and that was zinc paint. When they had got a good covering of red lead paint on the iron, and no rust (a particle of rust underneath would most certainly allow the rusting to go on), he did not think it mattered much what they put on the top of the red lead—whether oxide paint, tar, varnish, or graphite, or any of the well-known paints. In one of the six holders of which he was speaking, the two bottom lifts were erected in the year 1853; and these lifts had not been re-sheeted since. The sheeting, which was put in 52 years ago, was in better condition to-day than any of the sheeting of their more modern steel-sheeted holders. So far as he was able to make out, the holder was originally coated with red-lead paint. He was not at all sure that oxide paints were used in those days at all. It had certainly led them at Bradford to pin their faith firmly to red lead for ironwork; and he did not think there was a square foot of rust on that holder at the present time. With regard to the cleaning of the sheeting or ironwork of gasholders after it had been once allowed to rust, he must say he did not know any practical means of doing this. In the course of their experiments, they even went so far as to clean a portion with a sand-blast. It could be done in that way; but in his opinion it was not practicable for a gasholder. However, it seemed to be the only method of getting a surface mechanically cleaned. He was strongly of opinion that every gasholder ought to be covered with paint or tar varnish once a year. He thought it false economy to allow holders to go longer than this.

Mr. J. F. BELL (Derby) said, before he discussed the paper, he felt sure the other members present would join heartily with him in congratulating Mr. Fowler on the mark of confidence of the Midland Railway Company in appointing him Assistant-Manager to their locomotive works. He could only say they all wished him success; and they hoped he would not sever his connection with the Midland Association. There was another gentleman he was glad to see present. That was Mr. Archbutt, who was well known as the Chief Chemist to the Midland Railway Company; and before Mr. Fowler replied to the discussion, perhaps the President would invite Mr. Archbutt to speak. He thanked both Mr. Fowler and Mr. Archbutt for the information contained in the paper, and for having placed at their disposal the results of the extensive experiments they had carried out in reference to the preservation of steel structures by means of paints. Mr. Archbutt, in connection with Mr. Fowler, had conducted some important investigations; and he (Mr. Bell) had profited by them. In painting the three largest holders at the Litchurch works at Derby, some twelve months ago, he followed the practice adopted by Mr. Fowler—that was to say, to first thoroughly remove the whole of the existing paint, then coat the holders with red lead, and, after this was perfectly hardened and dry, to coat it over with oxide paint. The only innovation he (Mr. Bell) introduced was the means of removing the then existing oxide paints. They found it was costly, difficult, and laborious to scrape off the whole of the paint; and therefore it struck him that perhaps by means of bunsen burners—by "frizzling" the paint—they could remove it. They used the bunsen burners with an air-blast, and very easily got the paint off. He thought perhaps the applied heat might affect the seams of the holders; but they found the sheets were not very much hotter than the crown of the holder would be on a hot summer's day. In fact, this treatment did not appear to affect the seams in any way. They had dealt with their three holders in the manner described, and he was glad to say they were now in excellent condition; and he believed they would remain so for some years. He agreed with the President of the Institution that the best preservative was red lead. It required to be freshly mixed; and another thing was that the plates must be perfectly dry before the paint was applied. One other small matter related to the water in the gasholder tanks. If by any means this water could be removed from time to time, so as to keep it pure, it would tend to preserve the paint on the holder. A large amount of capital had to be invested in their gasholders; and he was certain a little consideration given to, and some money spent on, them from year to year would be well repaid.

Mr. L. ARCHBUTT, Chief Chemist to the Midland Railway Company, thanked the President for inviting him to be present and to speak. He did not, however, know that he was so well qualified to make any remarks on this subject as other gentlemen who were present, because what he had done was simply in the nature of experimental work. In conjunction with Mr. Fowler, he had for the last twenty months been experimenting on different paints for ironwork, and had got some useful results which he hoped to extend as time went on. With reference to the question of the removal of the oxide from steel, which was touched upon by the first speaker, he thought that if they could keep the mill scale perfectly

intact upon the steel, it would itself be a good protection; but as practically they could not do this (seeing that as they erected a gasholder they were bound to perforate the plates), he was inclined to think it was better to remove it all, because magnetic oxide of iron in close contact with metallic iron formed a galvanic couple and, the oxide being the positive element, the iron would corrode. This action seemed to take place underneath paint; so that if they covered up the oxide, the work was badly done, and would not last. With reference to the use of red lead, more really depended upon the way in which work was done than upon the paint used. It was most important that the steel should be free from rust, and should be dry; also that the paint should be properly prepared, and be put on thinly, and that each coat should be allowed to become thoroughly dry before the next was applied. The best way to prepare red-lead paint was to take pure red lead and grind it with 10 per cent. of raw linseed oil; not simply stir the oil and red lead together, but grind it in a mill; then thin it down with boiled oil until it weighed 30 lbs. to 40 lbs. to the gallon. The paint should be put on with good brushes and by good workmen, and allowed three or four days to dry, and if then another coat was applied and dried, they could put any paint they pleased on the top; it did not make much difference what it was. With reference to graphite paint, they had made some experiments with it; and he could confirm the remarks made by a previous speaker, that it was very good. It answered almost as well as the red lead they had used. With reference to oxide of iron, he thought one gentleman had referred to it rather disparagingly. He was inclined to agree with him; but there was a great difference. If they took oxide of iron prepared from copperas, which had a high covering power, that paint, from his experience, was of very little use; but some of the coarse native oxides which had only slight covering power, had a much greater protective effect. He quite agreed that gasholders should be painted once a year, because the conditions in which holders worked—going up and down, and in and out of water—were very difficult; and his experience was that, however carefully red lead was put on, they could not depend upon it for longer. Pitting was liable to commence in twelve months or thereabouts. The method they were using for testing paints generally for steelwork was to take steel sheets measuring 1 foot by 2 feet, which was a convenient size; and a sand-blast was used, so as to remove every trace of oxide. Then the sheets were carefully painted under his superintendence—two with the paint under experiment, and two with the standard mixture of red lead and boiled oil. These were fixed to the sides of one of Mr. Fowler's holders, and they went up and down into a tank of water—not in the alkaline water of the ordinary gasholder tank, but in an independent tank containing clean water. They had in this way tested several paints; but up to the present they had not found any so good as red lead. Next came graphite. The red lead should be freshly prepared. If it was for a large job, they should grind it day by day, as required. If it was only for a small one, they might grind up with raw linseed oil as much as was wanted; then keep it well covered up, so that it was not too much exposed. It could be diluted with boiled oil from time to time as wanted.

Mr. Fowler, in reply, said, with regard to the question of not removing the whole of the scale, he thought perhaps he had not made himself quite clear. When a plate came from the mill, it might have two classes of scale on it—one of appreciable thickness; and the other, which was underneath, a kind of finish to the plate. It was this finish that they ought not to touch, if possible. Certainly it was almost of microscopic thickness. If they tried to chip it off, it would be found that it would not chip off an appreciable distance on either side. They had a holder put up some ten or fifteen years ago. Some of the plates hardly required any attention; and they found that those that did not give them any trouble were those in which the thin roll scale had been left on. He should like to ask the President of the Institution whether the iron plates which he stated had been up fifty odd years had still the mill finish on them.

Mr. Wood: We have never taken the paint off to see.

Mr. Fowler said they knew these thin sheets were not subject to the same inspection as the larger sheets; and there was a tendency to afford an appreciable sheet of scale.

Mr. Wood said he forgot to mention that these sheets were Lowmoor iron.

Mr. Fowler (continuing) said, with regard to the question of graphite, he thought Mr. Archbutt would agree with him that it was not safe to put an ordinary amount of graphite on. There was a great tendency for it to separate more. With sixteen holders spread about, they wanted something which would be as reliable as possible. He was sorry Mr. Stevenson, of Long Eaton, was not present, because he believed he had been using graphite with great success on a holder that he had given up almost as hopeless. He should like to ask Mr. Jones how old the plates were on the holder when he had to re-sheet it.

Mr. Jones said 35 years. He ought to mention, however, that the reason the re-sheeting was done then, and not later, was that the cup failed; and he thought it better, while they were putting in a new cup, to re-sheet the holder.

Mr. Fowler said they had used the sand-blast, and found it too expensive; and they had recently tried a more ingenious arrangement—viz., a brush driven by an electric motor. But they had not yet hit on the right brush or the right connection. It had to be a strong brush that would stand mechanical pushing up and down a plate. Still they hoped that by means of a circular brush, driven by an electric motor, they would obtain better results in removing the rust, and getting a better surface for putting on the paint. With regard to the paint itself, they had found out that red lead was the best substance. Mr. Archbutt had referred to one reason why they were not letting the plates go up and down in the gasholder tank. Another was that they were situated close to a factory, and nearly all the boys appeared to have a liking for throwing sand into the tank; and they had to take these measures to protect the plates.

A vote of thanks was passed to Mr. Fowler and Mr. Archbutt for their interesting communications.

THE RECONSTRUCTION OF THE NORWICH GAS-WORKS.

ILLUSTRATED BY LANTERN VIEWS.

[*See Illustrated Description in* "JOURNAL" *for Sept.* 19 *and* 26.]

Mr. Thomas Glover, the Engineer and Manager of the Norwich works of the British Gaslight Company, made a (for a District Association meeting) somewhat novel contribution to the proceedings. In effect, it was a pictorial description (by means of lantern and slides, numbering not far short of 100) of the great changes that have been effected in the Norwich Gas-Works by re-arrangement and reconstruction, and, as picture after picture was presented, Mr. Glover gave explanation. It is unnecessary to accompany Mr. Glover closely through this account, inasmuch as we were enabled, through his kindness, to give to our readers, in the last two issues of the "JOURNAL" in September, a complete description of the work which formed the subject of his highly-interesting communication to the members.

The notes with which Mr. Glover prefaced the main part of his contribution were as follows:—

At the request of our worthy President, these notes and illustrations of work carried out at the Norwich works of the British Gaslight Company are offered to the Association in the hope that they may be of sufficient interest to justify the writer in occupying some of the valuable time at the disposal of the Association.

It was in the year of the writer's presidency of this Association (1901), that he was called upon to succeed Mr. John Young (an ex-President of the Association) in the management of the Norwich works. An uphill fight was at that time being successfully waged against the claims of electricity, supported by strong local influence. Public opinion was being gradually won over to a more generous appreciation of the Gas Company by the tactful methods employed in dealing with the consumers, and by the evidence of a new *régime*, characterized by vigour in satisfying old consumers and in securing new ones.

For some time after the management had been taken over by the writer, the task of placing the gas supply on the level of public esteem which he believes to be its rightful place, was magnified on the one hand by the hastily organized staff of outdoor fitters and the indifferent quality of their work, and on the other hand by the manufacturing plant, which could with difficulty be made to supply a constant and satisfactory quality of gas.

Competition, if taken in the right spirit, acts like a tonic; and expanding business brought a feeling of exhilaration which more than counterbalanced the depressing influence which worn out and badly arranged manufacturing plant had on one fresh from a works where the manufacturing results were pretty near perfection. To help on the expansion of business by the adoption of commercial methods of advertisement and introduction (unknown usually under municipal ownership) was a pleasant and stimulating change, especially as it was felt that the growth of business would lead to the building of new works or the re-modelling of the existing manufacturing plant—an opportunity every energetic engineer yearns for, to test his resources.

The increase in business has been sufficiently remarkable (the consumption of gas in 1897 was 275,975,000 cubic feet, and in 1904 435,804,000 cubic feet) to warrant a little time being devoted to an examination into the methods employed, and the results obtained. First, as to prepayment work, the additional charge made over the ordinary price for gas is 11d. per 1000 cubic feet. This covers the rent of meter, the rent of stove, and the rent of fittings. The average consumption of gas per prepayment consumer is not high—about 11,000 cubic feet. This is accounted for chiefly by the frugal habits and low-spending power of the working-class people in Norwich. With penny-in-the-slot meters, four lighting points and a cooker are provided. In better class cottages, where the average consumption is likely to be higher, shilling-in-the-slot meters are fixed, with fittings of simple but tasteful design. Six lighting points are provided (two with incandescent burners), and a good-class cooker.

The writer's Company had been fortunate in securing premises in a central position in the city for show-rooms and offices; and subsequently a second purchase was made two years ago of adjoining property, which allowed of considerable additions being made to the accommodation, both for show-rooms and the increasing clerical and collecting staff. The fine display now made of modern fittings, lamps, heating and cooking stoves, water-heaters, and other apparatus, has helped in no small way to impress the public mind in favour of the Company's enterprising

business methods, and the usefulness of gas for manifold purposes. [Here Mr. Glover exhibited various illustrating slides, among them being one which gave the figures referring to three months' business in cookers, fires, water-heaters, fittings, lamps, burners, &c.]

Three Months' Business in Gas-Cookers, Fires, &c.

Services Laid.	Ordinary Meters Fixed.	Prepayment Meters Fixed.	Houses in Course of Erection Piped.	Gas-Cookers Fixed.	Gas-Fires Fixed.
403	54	351	55	316	213

Geysers Fixed.	Outside Lamps Fixed.	Prepayment Fittings Installed.	Public Lamps Fixed.	Cookers Cleaned.
25	71	370	24	421

How far the public are influenced by advertisements may be an open question. Advertisement alone would soon be of little value; but when supported by the attentions of a vigorous outdoor staff, business does result from the combination. A good show-room is one of the best forms of advertisement; but judicious newspaper, magazine, and bazaar-catalogue advertisements are also advisable. [The succeeding slides showed a variety of advertisements that had been used with success.]

One other important factor which has contributed towards the success of many gas undertakings (the Norwich works not least) has been the conversion of the street-lamps to the incandescent system. There are now 2047 gas-lamps in use; and the whole of these have been fitted with No. 4 Kern incandescent burners at the Company's expense. The improvement in street lighting brought about by this change has been greatly appreciated by the City Council and by the citizens generally; and it has been one of the best advertisements the Company could have. By improving the lanterns, we have now got the consumption of mantles down to such a point that the Welsbach Company are willing to take the maintenance over on the basis of eight mantles per year.

In church lighting, the Company have also been doing a good bit on the principle that they will stand the expenditure, and recoup themselves from the saving in the gas-bill. I recommend the same system to all of you who have poor churches. They will readily take it on.

Having thus briefly glanced at the methods employed to lay the foundations for future business, Mr. Glover then directed attention to the problems of works' reconstruction which confronted him; and, by means of the lantern slides, he gave the members a good idea of how the admittedly difficult problems he had had to face were gradually solved and a gratifying success achieved. He started with the plans and photographs of the old Bishop Bridge works and the St. Martin-at-Palace works, showing their crowded and dilapidated condition, owing to circumstances fully explained in our previous articles. The old system of working and the plant were revealed with all their deformity. Then came the pictures showing the demolition, the while gas making was continued. The rapidity of the reconstruction under disadvantageous circumstances evoked the admiration of Mr. Glover's hearers. One of the scenes brought into view the carburetted water-gas relief holder. This led the lecturer to incidentally remark that the water gas was scrubbed before being put into the relief holder; thus preventing a great deal of tar forming. What can be done by the reconstruction of inefficient plant was shown when it was pointed out that on the ground where the old retort-house stood at the St. Martin-at-Palace works there is at present producing plant equal to 2½ million cubic feet compared with 1 million formerly. Mr. Glover explained, as we did in the former articles, the reason for adopting ten retorts in a bed. Speaking of the combustion chambers, he illustrated three forms of construction. In one the combustion chamber was built of Yorkshire silica, and in another of Derbyshire silica; and these had given perfect satisfaction. The third chamber, however, was built of Scotch silica; and in this case there was a decided contraction—the arch enclosed by the combustion chamber being considerably less than it was originally. Another point was that the first bench Mr. Glover put up was fitted with dry mains with throttle valves. He expected to get as good results as he had obtained for six-and-a-half years in the Midlands. But two or three circumstances were against it. In the first place, he had in the Midlands coals to deal with which produced much more tar than the Durham coals; in the second place, they had ten levers to negotiate from ten retorts; and in the third place, they had compressed-air stoking machinery, which moved about very rapidly. "Combined, these things managed," said Mr. Glover, "to make a mess of my dry main; and I had such a worried time that I said, 'enough of this for T.G.'" He therefore adopted a good form of hydraulic main, and the tar-tower system. He was, he remarked, now able to work with extremely light seals, and had now no difficulty, when he had the right coal, in getting 11,000 to 11,300 cubic feet of gas to the ton—as the maximum.

[We do not think, after the full description already published, that there are any more points that require notice. The lecture was a great success, and Mr. Glover was very warmly applauded at its conclusion.]

Discussion.

Tea having been served,

The PRESIDENT said they had had an excellent account from their friend Mr. Glover of the works' changes at Norwich; and it had, he was sure, interested them all very much. He had the privilege of going round the Norwich works before the commencement of the alterations; and he should have greater enjoyment in visiting them again now.

Mr. EDWARD ALLEN (Liverpool) said he had to thank the President for the kind invitation he was good enough to send him; and to say that the pleasure he had anticipated had been fully realized. They had just had an exceedingly pleasurable visit to Norwich with Mr. Glover; and they must all admire the courage and perseverance with which his great works' scheme had been prosecuted. The work was well conceived, and well carried out. Having seen the pictures, his (Mr. Allen's) next wish was to see the real thing itself, when he hoped to go over in detail the interesting points raised by Mr. Glover. A great help had been given to them by the able references to the works in the articles that had appeared in the "JOURNAL OF GAS LIGHTING." The reading of these articles had enabled him to follow the pictorial description much more easily. He must say he was rather proud of Mr. Glover as a Lancashire man. He served at St. Helens under his able brother. Then he came to the Midlands; and it had been to the advantage of the Midlands, because his record at West Bromwich was a good one. He was sure, too, they had every reason to congratulate those who managed the gas affairs of Norwich, in having obtained his services. These were words of truth and soberness. He trusted Mr. Glover would live many years to serve the gas industry, and to ornament it.

Mr. J. W. HELPS (Croydon) also thanked the President for having invited him to the meeting. It had been to him a great pleasure to listen to the lecture; but he had realized the greater pleasure of having seen the works themselves. A short time since, when he saw in the "JOURNAL" an illustrated account of the works, it did not take him very long to write to Mr. Glover, and ask whether he would receive him there, and allow him to go over them. Mr. Glover at once heartily said "Yes." He went down to Norwich; and he must say that the works were to him (Mr. Helps) evidence of the truth of the saying that "Necessity is the mother of invention." Because it was not easy to imagine any more difficult position in which a gas engineer could be placed than that which faced Mr. Glover some two or three years ago. He did not think he had ever seen anything that had given him greater pleasure, and which indicated more to him how very extensive must be the knowledge of the gas engineer, and how great the energy of one must be who had to carry out such a scheme as he (Mr. Helps) then saw. There were one or two points that specially impressed him in reading the account of the works, and which particularly caused him to go down and see them for himself. Knowing the great interest that Mr. Glover had taken in the question of naphthalene, he was rather struck with the principle of the condenser he was adopting; and he wanted to have a look at the apparatus. The second question was with regard to the purifiers. He saw he had adopted a three-storey building. It seemed to him (Mr. Helps) in these days when oxide purification was becoming more general, that the number of times a purifier had to be opened and emptied and refilled in the course of the year was becoming less and less; and therefore the adoption of any expensive system of building and machinery was less necessary than before. He had thought that possibly Mr. Glover might be making some mistake in this direction. He found, however, on going to his works, the reason for his plan was that he had very little space at his disposal; and as he had nothing to pay for sky space, he went up instead of spreading the building over a larger ground area. He (Mr. Helps) was also interested in Mr. Glover's method of storing liquor and tar. He thought he had adopted a wise plan in using above-ground storage tanks instead of expensive underground tanks. Some people objected to these over-ground store tanks, inasmuch as they said they found it difficult to get separation of the tar and the water. He should very much like to know whether Mr. Glover had had greater difficulty with his tanks placed as they were, especially in cold weather, than he had when they were below ground. Mr. Glover had also told them that it was not a good thing to draw the gas through the scrubbers; but circumstances forced him to adopt the plan. What would Mr. Glover do when he found these tower scrubbers getting blocked? It seemed to him (Mr. Helps), when they had to deal with the suction side, the difficulties would be somewhat greater than if the scrubbers were on the pressure side.

Dr. H. G. COLMAN (London) also expressed his obligations for the invitation he had to the meeting. He was likewise in the happy position of having been round Mr. Glover's works; and it was a most instructive day. There was only one point with regard to the effect of the overground tanks on the tar. He thought this was a matter that would much depend on the nature of the tar. The higher the temperature employed in the carbonizing of the coal, the more likelihood was there of the thick tar when exposed to the atmospheric temperature, by being above ground, being so thick that the liquor in it would not be able to separate out. This would depend upon the nature of the coal used and the temperatures employed in carbonization. In Mr. Glover's case, where he was getting 11,000 or 11,500 cubic feet of gas per ton, he (Dr. Colman) did not suppose that he experienced very much difficulty in that respect.

Mr. GLOVER said he desired to thank Mr. Allen and Mr. Helps for the kind words they said in appreciation of his paper. As to Mr. Helps's kind contribution to the discussion, he desired to say that the separation in the over-ground tanks had not up to now given them any trouble, and the separation went on very much better in the tanks such had been shown (see photograph on p. 741, Sept. 19) than in shallow wells. They had already gone through one winter with the tanks; and the water in the tar had been down as low as 2 per cent. and as high as 6 per cent. He did not think it had exceeded 6 per cent.; and he considered this was, as regards water in tar, pretty good. No tar distiller would object to that. In the old wells in former days, they had had water in the tar up to as high as 30 per cent. Depth he thought was a great matter, in connection with the tar-tanks, to get the tar free of water, and give it plenty of time to settle out. He did not think the cooling effect would influence it very much, because really there was a big bulk of tarry fluid in these tanks, and they were constantly pumping comparatively warm tar into them. Dr. Colman had discussed this matter a little; and perhaps this reply would also apply to his remarks. He thanked the members very much for the kind way in which they had listened to the paper. In connection with it, the greatest amount of trouble had been taken by his laboratory assistant (Mr. Matthews) and his chief assistant (Mr. Moon), in preparing the slides.

Mr. J. H. BROWN (Nottingham) followed with his paper on "Coal Testing." This appears on p. 305 of the "JOURNAL" to-day, together with a report of the discussion to which it gave rise.

On the motion of the PRESIDENT, a hearty vote of thanks was passed to the readers of the papers, who each acknowledged it.

THE RECENT ILLNESS OF MR. CHARLES HUNT.

The PRESIDENT said they all regretted that their old friend, and indeed one of the founders of the Association, Mr. Charles Hunt, was not present that day, owing to the serious illness he had had. He was now almost well; and he (the President) thought they ought to pass a vote of sympathy with him in his illness, and rejoice in the fact that he was now better.

The HON. SECRETARY said he had received a card from Mr. Hunt, who asked him to convey to all friends his kind regards. He said he was now in very good health, but his doctor would not allow him to leave home just at present on account of the trouble with his leg.

The proposition was heartily agreed to.

THE QUESTION-BOX.

The PRESIDENT said that Mr. George Helps had a report to make on the subject of the "Question-Box."

Mr. G. HELPS (Nuneaton) said that, when this matter last cropped up, he gave the members to understand that he was of opinion that the "Question-Box" would be of some use to them. He had considered the whole subject since, and had not arrived at the same conclusion—roughly on these grounds: The framing of an answer to a question depended very greatly on a knowledge of the questioner; and when there was only the phraseology of the question to guide one, an answer might take a shape that would suit almost everybody but the questioner. A man to ask a general question intelligently, must require intelligence; and a man who asked a technical question, generally required to have had some training in connection with the subject in which he desired to appear interested. A little knowledge was a most dangerous thing. (Laughter.) Very often one saw questions asked that might be answered in a hundred different ways—all depending on the peculiar circumstances that existed. If a stoker asked a question, they would know how to reply to him. If a labour member on a council asked a question, they would know how to reply to him. But how could one be expected to reply, in an appropriate manner, when there was only the phraseology of the question to guide one, and probably this had been edited? Again, there were people who required information that they had no right to, unless they were prepared to pay for it. Engineers and others in their industry were most free and generous in this respect; but the line must be drawn somewhere. If a man was in difficulties, he generally had a friend at his elbow. If this did not satisfy him, let him resort to a consulting engineer, or to the technical press. If this did not suit him, let him go to school again, and study the question. Then if he was not satisfied, he had better try another industry than gas. Under these circumstances, he did not think that the "Question-Box"—as he understood it, as it had been put before him by those interested in it in America—would serve any useful purpose.

The PRESIDENT said there was only one error in the report. Mr. Helps said those who were in difficulty should go to a consulting engineer or to the technical press. But when in very great difficulty, they should ask Mr. George Helps, and he would get them out of it. He was one of the best fellows in the world for helping anyone in trouble. He moved a vote of thanks to Mr. Helps for his report.

The members and their guests dined together in the evening. There were a few appropriate toasts; and these were followed by a musical entertainment, in which the artistes' beautiful renderings of the compositions they presented won great admiration.

PROFESSOR G. R. THOMPSON ON THE UTILIZATION OF FUEL.

A Lecture to the Yorkshire Junior Gas Association.

At the close of the Annual Meeting of the Yorkshire Junior Gas Association on Saturday (which is noticed elsewhere in to-day's issue), a lecture was delivered to the members by Professor G. R. Thompson, Professor of Mining at the Leeds University, on the subject of "The Utilization of Fuel."

INTRODUCTION.

The lecturer began by remarking that perhaps many of them had been asking why he had the presumption to address them, as an Institution of Gas Engineers. He had been asking himself that question, and also the question as to what he should say that was new. Both these queries, however, he had answered satisfactorily to himself; and he hoped they, too, would regard the answers as satisfactory. The reply to the first question was, because their President—or he should say now their Past-President—Mr. Cranfield, had asked him to. This was his only reason for addressing the members; he had not anything much closer than that with the gas industry. Then the answer to the next question was that, though he had nothing new to say, he thought he could give them the old information in a new light. He would appeal to them as a Yorkshireman to Yorkshiremen, in dealing with a subject of the utmost importance to Yorkshire.

LOCAL GAS COAL AND STEAM COAL.

The question of fuel would strike one as being of vast importance to his hearers, because it dealt with the Yorkshire coal supplies; and the output of their district was the largest of any—about 28 million tons. If they looked at the composition of this coal, they would find it was of a character very different from some of the Belgian and German coals, or even some of the American sorts. The characteristics that would strike them would be probably most obvious if he mentioned an approximate analysis of two different coals. They might take, for example, a coal known to those who worked in the northern district—Black Bed. This was used for gas production on a comparatively large scale in that part of the country, though it came from a small seam. In this case, the approximate analysis would give: Volatile matter, 29·5 per cent.; fixed carbon, 66·3 per cent.; ash, 3·6 per cent.; and moisture, 0·6 per cent. Then he might take a Barnsley hard coal which was used as a steam coal. If any of them would learn what steam coal meant from a text-book, they would find it recorded as being almost a semi-anthracite, containing very little volatile matter, and, of course, giving a great calorific power—a great amount of heat—per pound burnt, without smoke. A published analysis of the Manvers Main best hard (Barnsley) steam coal, was as follows: Fixed carbon, 61·84 per cent.; ash, 2·75 per cent.; and volatile matter, 35·41 per cent.

What claim had this latter coal to be regarded as a steam coal? They saw that all their preconceived notions regarding what was a steam coal would be quite beside the mark. They might have regarded it as a gas coal, on account of the volatile matter; but certainly, as a steam coal, they would have thought that it did not fulfil any of the conditions that a steam coal should. In one respect it was very satisfactory—it was pretty hard coal. It would stand a good deal of knocking about without being broken; and consequently it could be put (say) into the furnace of a locomotive engine without there being a lot of dust with it, and therefore without this dust coming out of the chimney—or the apology to represent a chimney—of the locomotive. On account of the high pressure at which locomotives were worked, and the great quantity of air that was rushed through them, any small pieces of coal would be blown out of the chimney unburnt; and so, for best locomotive practice, they required really a coal that would not go into very small pieces in handling. While the hard coal they got in some of their seams would be a satisfactory locomotive coal, it also gave a fairly high calorific power, which could only be excelled by the highest class of steam coals—and they would not excel it very much. They could take the calorific power of all these coals, if they could use them well, as being satisfactory.

Having regarded these two types of coal—the steam coal, so called, and the gas coal—what would they expect in a district that produced these, they might almost say, extreme types? The coals having a great deal of volatile matter would, of course, be very suitable for the gas engineer; and the gas engineers flourished in a county such as theirs, where gas coals were very cheap and plentiful. They had every facility for making gas. Conditions were not always the same in all parts of the world. In some places—for instance, in Belgium—gas coal was much scarcer, and more costly in consequence. In Germany, a great deal of the coal was of a sort of semi-anthracite and steam coal character. It would give a very little volatile matter compared with the coal of their own district. At the same time, there were, of course, what were called the "fat" coals; and these were utilized for gas-making purposes. Some Canadians who wished to score off him in an affectionate, fatherly sort of way, had remarked on the fact that in England people still stuck to the old-fashioned gas, whereas every town in Canada had electric

light. If they had had different coal in England, they would have had electric light much sooner than had been the case.

The Smoke Problem.

What was the good fortune of the gas engineer, however, was not absolutely the good fortune of the district in which he and his listeners resided. The manufacturer or the householder had to take the coal the district provided him with; and he used it either to the best of his ability or to the second best. He would not say that he always utilized it to the best of his ability. In utilizing it, difficulty resulted. The difficulty of properly burning coal containing much volatile matter was so great that even those with the best intentions usually failed partially. Those who had not the best intentions, or were not the most expert, failed very frightfully indeed. The effect of this failure was that they had black, tarry smoke issuing from all their chimneys, which resulted in a murky gloom hanging over Leeds; and the same gloom, he thought, was shared by most towns that burnt this kind of coal.

He thought at first that he might have proved to them the effect of the burning of this bituminous coal on the climate by a very short example. They had in Leeds a sunshine recorder; and at a place some distance out of the town—Adel—they had a similar instrument. Comparisons were started in 1887 by the Leeds Philosophical Society; and these showed that Leeds was sadly deficient in sunshine, when contrasted with Adel, which was some 3 miles away. But it could not be said that this difference was due altogether to the pollution of the atmosphere, because Adel was more elevated; and the difference in moisture had an effect on observations of the sun's light which would put direct proof out of the question. His colleague, Professor Cohen, Professor of Organic Chemistry at the Leeds University—who he wished the members had got to address them that day—had done a great deal of work in this direction; and he (the lecturer) was indebted to him for the use of lantern slides which he thought would make his meaning clear.

The Lantern Slides.

The first slide was a table of observations made by Professor Cohen to show the variations in the sunshine records of places in and around Leeds; but Professor Cohen had endeavoured to measure the quantity of daylight, not bright sunshine simply. The result proved that on very few occasions did the station farthest away from the manufacturing part fall below the others in intensity. He had also estimated, from various experiments, that in Leeds in 24 hours there was discharged into the air about 20 tons of smoke. Of this soot, or tarry carbon, 10 cwt. fell, from 20 to 25 lbs. remained stuck to the object it dropped upon, and the rest was blown or washed away. The 20 tons mentioned represented 1·2 milligrammes of soot in every 100 cubic feet of Leeds air, or 24 times the quantity found at Pool, 9 miles distant. One way in which the amount of soot was indicated was by taking first of all clean snow from the surface, and then melting it. The snow would carry down a part of the soot in the atmosphere. Another section of the same surface was similarly treated on the following day, and the difference between the two thus ascertained. Another method of appreciating the pollution of a town was by comparing spring with autumn or winter. In spring, just after the plants started, they had rapid growth and fresh surface of vegetable matter in towns, almost the same as in the country; but this state of affairs gradually changed, until the whole of the vegetation became covered with a black mantle. If this was cleared off, it would be seen that the leaf had ceased to carry on its functions. The difference in town and country air was due to various forms of pollution. Professor Cohen had estimated the impurities existing in town and country air; and he (the lecturer) wanted his hearers to note especially the items of soot and sulphuric acid, because he hoped that later on they would have something to say with reference to these. The soot in town air was 1·2 milligrammes per 100 cubic feet, against none in country air; while as for sulphuric acid, this rose in the case of town air to 3 milligrammes per 100 cubic feet.

[Professor Thompson, having fully illustrated these points to the members by means of tables and pictures thrown on to the screen, then proceeded to show a series of exceedingly interesting views of a manufacturing portion of Leeds, indicating how the air was polluted—chiefly by the big factory chimneys, but also to an important extent by the smaller chimneys of houses.]

The lecturer remarked that he thought the slides he had exhibited would make very clear the nature of the gloom—it was due to their possessing the coals of which he had spoken. If they wanted to make the impression any stronger, they should get a contrast with a district or country that had simply anthracite to burn, and one in which coal might be rather dearer than in Yorkshire. On going to the towns of Germany—a district, for instance, like Düsseldorf—one was impressed by the park-like streets and the absolute absence of soot or smoke. And this was in spite of the fact that at Düsseldorf there were factories, and the population was about half that of Leeds. The same would apply if they went to an anthracite district in America. Soot and smoke were practically non-existent; and there was only the carbonic acid and sulphuric acid pollution, without the other.

The Duty of Gas Engineers.

They might say to themselves, What bearing has this on us as gas engineers? He himself hoped that it would have really a big bearing, and that they, as junior gas engineers, would do something to remove the trouble. He did not wish them to do it out of kindness of heart for the community, but for the sake of their own industry—to extend that—and also out of feeling for their coals and their coalfield. The gas industry in 1902 had about £113,000,000 invested in it; 14 million tons of coal were carbonized; 150,000 million cubic feet of gas were sold; and there were 4·2 million consumers. Probably the gas that was made and unaccounted for was something like 8 to 10 per cent.; but he did not know whether his hearers would agree to this. The figures he had given were more than double what they were twenty years ago—that was to say, with the exception of the number of tons of coal carbonized, which was rather less than double. This showed that their work had improved, and that they had either prevented some of the leakage or increased the efficiency of the methods of manufacture so as to obtain more gas from the coal. They had very probably done both; but the difference, he should say, was more owing to the securing of a greater yield than to the stopping of leakage.

Coke-Oven Gas.

He was there practically as a representative of an industry that supplied gas engineers with the raw material. This industry had rather an affectionate interest in them; and it would be quite delighted if it could put up their costs (say) 1d. per 1000 cubic feet—provided, of course, it got the return. But outside this embarrassing interest, he thought the industry to which he referred would wish to supply gas engineers with the best material for their purpose, and also it would wish to work in closer touch with them. In fact, they were having development in the coalfield itself—a small development compared with the gas industry, but one, particularly in its connection with their own coalfield, which was bringing the mining part much closer to the gas-making part. There were, as they knew, retort-ovens which were intended for producing coke and utilizing the bye-products. A coke-oven for this purpose such as would be put up at a mine was rather different from the retort which had to be put up at a gas-works, though this apparatus had been used for producing light.

In the oven of which he was speaking, the carbonizing space would be about 32 feet in length, 6 feet or 6 ft. 6 in. high, and the width would be from 18 to 22 inches, according to the coal which had to be carbonized. The charge for such an oven would be about 10 tons, and the yield of coke something like 7 tons, while the time taken in coking would be about 36 hours. They would see that the conditions of carbonizing at a gas-works were very different. Instead of the retort with its comparatively thin walls, they had really a brick lining. The oven was built of small brick; and it had a hollow space round it, fitted with flues, for combustion. These ovens might be arranged in batches of thirty; and the gas going from them would be collected in a hydraulic main, carried in pipes to condensing and scrubbing plant; and then, after the ammonia and benzol had been extracted, it would be brought back to these flues and utilized for burning the charge. Often with the rich coals and the better class of these ovens, there was a surplus of gas, which would be used, and had been used, for lighting villages. It was proposed to so use it now, or it would be sold (say) to gas-works. An example of this was to be found in the States, in connection with some Otto-Hilgenstock ovens outside Boston; and he thought that at Royston they had the same sort of thing—the gas was used for lighting a colliery and village from the coke-ovens. These were very insignificant compared with what would be produced in gas-works; but still it was a quantity which could be increased if necessary. It had also been proposed to use the gas for power purposes; and just outside Leeds it had already been employed to the extent of 500-horse power.

The feature he would like to bring before them—now that he believed gas engineers were discussing the possibility of utilizing retort-ovens for their own work—was that the retort-ovens were developed, not for generating gas, but to get good coke cheaply. The gas was a bye-product. He was not specially interested as to whether they were better or cheaper to maintain than gas-making retorts. The point that did interest him was that in these coke-ovens—the retort-ovens which were put up at mines—they had a thick non-conducting wall. In order to prevent leakage in connection with these ovens, they had to be kept in good repair; and so the cost of maintenance was heavy. He had heard people say they should last, if well made, for seven or eight years without sensible repair; while others argued that a retort coke-oven was very satisfactory if it had to be repaired in two years—it still had paid for itself in residuals and a greater make of coke. The point he wished to place before them for consideration was this: If they took this oven 32 feet long and about 20 inches wide, they would find there was a heating area of something like 400 square feet—that would be the area of the side walls of the oven. This was the heating area, and the coal coked was 10 tons in a day-and-a-half. The coal coked therefore per square foot of area would be $\frac{1}{40}$th ton per day-and-a-half, or $\frac{1}{60}$th ton per day.

The thing that most impressed one, if the matter was looked at in this way, was the very slow rate at which this huge machine worked. Compare this with the method of (say) a locomotive boiler, which had a fairly large grate area for its size; and with this grate area it was capable of completely burning from 40 lbs. to 120 lbs. of coal per square foot per hour. The one thing was a huge very slow mechanism transferring heat from the burning

gas to coking coal; while the other was a very rapid mechanism for burning coal and getting the heat out of it.

Producer Gas.

It had, of course, often been proposed by gas engineers to develop the gas industry, so as to produce cheap fuel for lighting and cheap fuel for power. If they thought of the very small yield of gas for the size of the retort-oven he was speaking about, they would see that this means must be expensive as compared with direct burning; and if they wished to get improved results, they ought to seek to make the transference of heat across the walls to the coking space as quickly as possible. The thick wall he should regard, from a gas-making point of view, as rather retrograde, in getting a very big machine to do a very small quantity of work. He did not know how they would improve this machine, or get an increased output from their own gas-making plant; but he felt convinced of this—that output would have to be stimulated in some form.

There were many forms of producer gas; and water gas was, of course, a very necessary adjunct to many gas-works. The producer was capable of dealing with very much more fuel, and converting it into gas. It corresponded very nearly with the blast-furnace or locomotive boiler. When therefore they got a machine of this kind, capable of converting much more coal into gas, and converting it perfectly, they would expect to produce the gas cheaper. So that he thought they would make advance in the direction of stimulating the production of the plant by increasing the rate at which it worked, and that they would thus get a saving of cost and cheaper gas.

Gas Made at the Pit.

The next thing he would like to ask was whether, if at the mines they could develop retort-ovens, or gas makers could go to the mines and develop part of the produce—develop it as gas—it would be possible to utilize that in distribution. Before the Royal Commission on Coal some very good evidence was given in this connection; and Professor Unwin had read a paper before the Institution of Gas Engineers dealing with the same subject. Those of his hearers who desired to follow the matter up, would find that Professor Unwin gave a very full statement regarding friction in pipes. In relation to this question of distribution, he would like to point out that in mines it was necessary to supply the workmen with air, just as they supplied gas. This was done by means of fans. The problem they had to deal with [which the lecturer explained] was pretty nearly the same as that of the gas engineer. If they wished to transmit very big quantities of air, they must use some method of reducing the velocity. If it was transmitted any considerable distance, the idea of reducing the velocity by putting in large pipes meant increasing the capital expenditure. The alternative was to put it in a smaller volume. If they halved the volume of the same quantity of gas, they halved the velocity, and if they quartered the volume they quartered the velocity.

Coming again to the Royal Commission there was a scheme, of course, for transmitting producer gas—there was a Mond Gas Company for distributing this power—and this called attention to the possibility of distributing the rapidly formed producer gas. Professor Burstall, in his evidence before the Commission, gave calculations as to the loss that would be sustained in transmitting gas at various pressures. Taking the example of 4 atmospheres and the velocity in a main 48 inches in diameter as 30 feet per second, he found that the transmission of gas could be carried to 80 miles, and the main would take 75,000-horse power. The efficiency of this transmission would be 87 per cent.—in other words, the loss of power would be only 13 per cent. That was to say, if they wanted to use the gas for heating at 80 miles distance, they could carry the equivalent of 75,000-horse power through a 4-foot pipe, and they would have 87 per cent. of the heat. The gas he was dealing with was producer gas; and he was reckoning 70 cubic feet per hour for giving 1-horse power. This meant that he could transmit that distance 5¼ million cubic feet per hour. This would show the possibilities. But the producer gas was rather heavier than the ordinary gas, and so would take more power to distribute. Thus his hearers would be better off if they could get gas at the pit.

Remedies for the Smoke Nuisance.

If they set to work and tried to get rid of the smoke nuisance, it might be possible for them to convert the coal and distribute it partly as illuminating gas and partly as coke. The coke had, of course, up till now been chiefly prepared for metallurgical purposes. Any arrangement of this sort would have to be a kind of collective scheme—a matter of buying gas from various small pits, and sending it at high pressure to a central point for distribution. By such a scheme as this, it might be possible to utilize more fully their gas coals. Even without this, the gas industry was capable of doing much more if it could supply a little cheaper gas.

Now he would venture to put before them one of their duties—the attempt to remove from the public the smoke nuisance. He would ask them to try and accomplish this by increasing the facilities for using both gas and coke. He knew that they aimed at doing this; but was it not possible to do more? Would it not be possible to try and produce a coke which could be suitably burnt in private houses? With charcoal, for example, they knew that the temperature of ignition increased with the temperature it was made at—the higher the temperature it was made at, the greater the temperature of ignition. Was it not possible to develop, with their highly bituminous coals, a type of coke that would be more or less half way between the present coke and bituminous coal—which would be capable of ignition and burning with a feeble draught, and besides being burnable without giving smoke? He thought it would be possible; but he was not certain whether it would be so commercially. There would be another way in which coke could be utilized. He saw in a paper the previous week that some London railway companies had been suffering at the hands of the Magistrates. They had been prosecuted for turning out smoke. The early locomotives used coke; but they now employed bituminous coals, which gave out a great deal of smoke, particularly if they were stoking on an up-grade. The difficulty in utilizing coke for a locomotive—he thought this was the difficulty, but was not absolutely sure—was that it took up more room for the quantity of heat it contained than the coal. So that for one purpose they wanted an easily ignited coke, while for the other (if they wished to satisfy the needs of the locomotive) they wanted a dense coke that would take up little space.

Another direction in which he thought the difficulty might be met would be by the utilization for private houses of a sort of close stove with a regular draught. This, in conjunction with a very little of their gas, would, he felt certain, make a much more convenient fire than even the present open style. The little gas they could provide, mixed with coke, would give illumination, and would increase the fire when necessary. He had seen such fires working and he thought they could be made very much more general.

Conclusion.

In conclusion, he would just like to point out two things. He thought when he promised to give this lecture that he might be able to prove something by the sunshine statistics. During the first ten years of the records there had been an improvement in the atmosphere of Leeds, which he ascribed to better methods of combustion and the use of electricity. He had tried to bring the statistics up to date, but found that since then the results had been so erratic that he could not make any definite deductions from them. Possibly there had been some further improvement; but it was nothing like what it ought to be. He found that quite recently Sir George Livesey stated that the black fogs of London were not nearly so thick as they used to be; and, of course, he took credit to the gas industry for it. He (Professor Thompson) hoped that in Yorkshire their rising gas engineers would do the same for them, and that they would be progressive until they got an atmosphere in the towns not much worse than that in the country.

The remarks made upon the lecture, for which the author was cordially thanked, will be found in the general report of the meeting on p. 314.

OBITUARY.

The death is announced of the Manager of the gas-works at Turin, the Cav. Luigi Beria. The interment took place last Saturday.

We regret to record the death, on the 26th inst., at the age of 78, of Mr. Allen Stoneham, who was for many years Financial Secretary of the Board of Trade, and Official Auditor of the gas and water accounts for the Metropolis.

PERSONAL.

Mr. Horace Long, who for eight years held the position of Chief Clerk of the Redhill Gas Company, under the late Mr. Charles Read, has been appointed Cashier, Registrar, and Accountant of the Company, and has also been elected an associate member of the Chartered Institute of Secretaries.

When the members of the Manchester City Council assembled on Wednesday for the final meeting of the municipal year, Alderman Gibson was present for the first time since his recent illness, which, it will be remembered, necessitated a serious operation. His welcome was an exceedingly warm one; aldermen and councillors rising and cheering him as he entered the room. Alderman Gibson has been in the Council for 23 years.

Among the passengers who landed from the *Himalaya* (P. & O.) last Saturday was Mr. W. A. Mackintosh Valon, who, after his considerable journeyings about the world over recent months, looks remarkably well, and is, in fact, in most excellent health. He has been to Canada, has visited the Rocky Mountains and the South Sea Islands, and has had a turn in New Zealand and Australia, staying, among other places, at Melbourne, Sydney, Adelaide, and Fremantle. On his way home he called at Colombo, and passed through the Suez Canal, reaching England, as said, last Saturday. He has had a remarkably good time, and, wherever he has been, has met with a very cordial reception from those representing the gas industry in the distant parts visited. The thorough change and great rest have done him much good; and, in bidding him a hearty welcome home, we may express the hope that the benefit derived may be of long duration.

THE "OMNIA" HIGH-STANDARD GAS-LAMP.

At this year's meeting of the German Association of Gas and Water Engineers, at Coblenz, some interest was taken in a high standard, with two arms and two lanterns, for incandescent gas lighting, exhibited by the Fabrik für Beleuchtungs-Anlagen, vormals G. Himmel, of Tuebingen, Würtemberg. These lamps, which were fixed at a height of 26 ft. 3 in. (measured from the ground to the light-centre), were each fitted with four specially constructed incandescent burners for low-pressure gas; and their illuminating power over a horizontal surface was claimed to far excel that of electric arc lamps of nominally equal power. The system is the invention of Herr G. Himmel, who described it in a paper read before the International Gas Congress in Paris as far back as 1900; and in November of the same year a fairly long illustrated abstract of his patent specification appeared in the "JOURNAL" (p. 1218).

As stated in the specification, the invention—to which various improvements have since been made—relates to the employment of incandescent gas-lamps elevated on masts or poles, and in other inaccessible positions, for illuminating open spaces; and it enables the lamps to be lowered, when necessary, for cleaning and other purposes. No ball-joints or flexible connections are used; the lantern, when being hauled down, disconnecting itself entirely from the service. The following are the main features of the arrangement: (1) A post with arms and piping, and a funnel-shaped connection, with stuffing-box. (2) A distributing cock, with stuffing-box and tubes leading to the burners, and an anti-vibrator consisting of a cased spiral

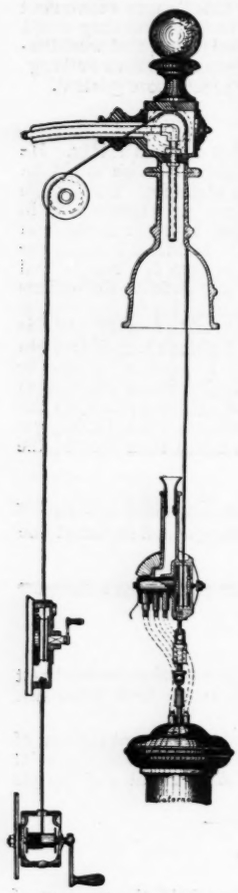


FIG. 1.

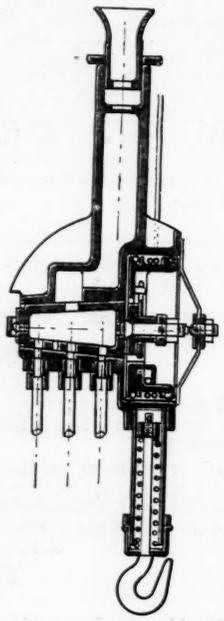


FIG. 2.

spring. (3) A regulating pulley, with crank handle, connected with the distributing-cock by means of an endless wire-rope. (4) A drum on which a rope attached to the regulating pulley is wound by turning the winch. (5) A gas-supply pipe, with tap, test-cock, and flexible connection with tap, communicating with a pressure gauge for the purpose of detecting leakage.

The accompanying illustrations show the general arrangement (fig. 1) and the distributing-cock, with stuffing-box (fig. 2). The connection of the lantern with the supply-pipe is effected by the stuffing-box attached to the distributing-cock. When the antern is pulled up, the brass-end of the gas-pipe inserts itself automatically into the stuffing-box. By turning the regulating pulley at the foot of the lamp-post according to the indications given thereon, the distributing-cock (which, with the stuffing-box, is permanently attached to the funnel, aud thus serves both as a connection and a guard), can be brought into various positions. The different positions of the cock are for: (1) Shutting off the gas supply altogether; (2) keeping the bye-pass flame alight; (3) lighting the gas automatically by means of a pill of platinum sponge after the gas supply has been shut off; (4) maintaining all four burners alight; and (5) maintaining two burners (or one) only alight. Should the manometer show that there is any loss of pressure in the service on testing with the distributing cock shut off, the lamp has to be lowered and the stuffing-box tightened.

It will be seen from this short description that the points to which special attention has been given by the inventor are: An efficient method of lowering the lantern, with a secure reconnection to the service on its being hauled up again; an absolutely gas-tight connection, with a simple device for detecting from below possible leakage; an arrangement for lighting and extinguishing, as well as for reducing the illuminating power by one-half, so free from complication as to be operated by any unskilled labourer; all the parts requiring constant attention—taps, connections, &c.—should not be fixtures on the post, but come down with the lamp; the lamp should be capable of giving a light of from 440 to 1750 candles, according to the area to be illuminated; and the steadiness of the lights even on stormy nights.

The superior penetrating power of incandescent gaslight during fogs and in dull weather renders it a most suitable medium for the lighting of harbours and railways; and this fact was early recognized by the authorities of the Würtemberg State Railway. Herr Hocker, the Government Surveyor and Chief Engineer of the Lighting Department, has, after long and diligent experiments, succeeded in so improving the lamps that they are now said to be working in a highly satisfactory manner—not only giving a splendid light, but also doing away with all trouble in lighting and extinguishing. Any unskilled labourer can perform these duties easily without hauling the lamps down. For over a year, on different stations of the railway, about fifty of the lamps have been in use; and that they have worked well (in spite of heavy storms and severe cold) is evidenced by the fact that before the end of the year the number in use will have been doubled. They are worked with ordinary low-pressure gas; and the illuminating power obtained is stated to vary between 440 and 520 candles. The system can, however, also be used in conjunction with high-pressure gas; and trials made in this direction at the Berlin Gas-Works are reported to have shown that, in this manner, the illuminating power of each lamp can be increased up to 1750 candles. The cost of the system is calculated to be only about half that of electric arc lighting.

Its advantages have caused the "Omnia" high-standard lamp to be largely adopted on other railways—more particularly on the Prussian State Railway. Here, as well as in Baden and Bavaria, a large number of the lanterns are in use; and the authorities everywhere are said to be highly satisfied with the results. Trials are also being made for lighting the harbour and the imperial wharf at Kiel. In Switzerland and Austria, also, the lamps are largely in use; while the suitability of the system for the lighting of towns is shown by the fact that, in addition to the experiments at Coblenz, lamps for street illumination have been installed at Stuttgart, Cannstadt, Nuremberg, Strasburg, Zürich, Lucerne, and Pressburg. Perhaps some English names may before long be added to the list, for we learn that Mr. R. Riches, of Mansion House Chambers, E.C., has now been appointed Agent for the system in this country.

Continuous Admission of Coal to Gas-Retorts.—M. Busse has taken out a patent, the French specification of which has been published, for apparatus for the manufacture of illuminating gas with continuous admission of coal. The rotating cylinders in the feeding-hoppers are provided with helical grooves, by means of which the coal is continuously fed into the retorts. The setting for these cylinders has a cooling arrangement to keep down the temperature and thus reduce wear and tear of the movable parts. The gas-chambers are combined in a battery by suitable conduits for the hot illuminating gas, which serves to heat two regenerators beneath each gas-chamber by means of suitably constructed flues. The coal is so distributed in the gas-chamber that the coarse lumps are accumulated close to the walls, while the smaller are heaped together in the centre.

A Wood-Stave Pipe-Line.—In connection with the electric light and power plant of Brigham City, Utah, it has been necessary, during the last few years, to construct a power station wherein may be utilized the water of a stream which flows through a narrow cañon, the mouth of which is situated about $1\frac{3}{4}$ miles from the centre of the city. According to some particulars in "Engineering News," the stream has a rapid fall through the cañon, amounting to about 250 feet per mile. The minimum flow of the stream is about 20 cubic feet per second, and the water is diverted from the creek by means of a dam and intake. This structure is of wood, with gates of the same material. Part, or the whole, of the stream can be diverted into a wood-stave pipe $30\frac{1}{4}$ inches in diameter, which carries the water along the cañon side down to the top of the riveted-steel drop-pipe which descends to the power-house. The total length of the wooden pipe is 5750 feet, or rather more than a mile. The pipe is constructed of Oregon fir, the staves being made from 6 in. by 2 in. stock; and the butt-joints between them were made tight by means of tongues inserted in saw-cuts. The tongues were made of No. 12 gauge galvanized iron, $1\frac{1}{2}$ inches wide, and $\frac{1}{4}$ inch longer than the thickness of the staves. When in place, these were encircled by iron bands $\frac{1}{2}$ inch thick. The bands were spaced from 12 inches (for all heads of water not exceeding 25 feet) to $3\frac{11}{16}$ inches for a head of 106 feet. For air connections at the two summits on the line, the action of valves, being uncertain, was not relied on; and instead of them there was placed at each summit an 8-inch vent-pipe, which leads up the hillside from the main pipe to a point above the surface of the water in the intake. The pipes for the vents were made of No. 16 galvanized iron. The contract for the wooden pipe was let for $11,694, which included building the pipe into place.

COAL TESTING.

By J. H. Brown, of Nottingham.

[A Paper read before the Midland Association of Gas Managers, Thursday, Oct. 26.]

Coal testing has during the last decade fallen into such disrepute that at the present time colliery representatives, when calling upon gas engineers, rarely, if ever, have sufficient courage to present to their prospective buyers a test of the gas coal offered, even though prepared by a most reliable authority. That such a state of things should exist is a matter of great reproach, for it surely is desirable, in the interests of both buyer and seller, that the latter should be able to present a statement of what any particular coal, unknown to the buyer, is capable of producing, which the engineer can accept as trustworthy. Such is, however, not the case to-day; and the majority of the members of this Association will no doubt agree with the author, that by far the greater proportion of the reports of tests of gas coals "are not worth the paper they are written upon."

At the author's works, a very reliable and accurate test of all coals within available distance from the works has been made. Yet during the present season some difficulty has been experienced in properly estimating the value of new coals, which, owing to severe competition, have been offered from far outlying districts; and although reports of tests have been presented by the colliery representatives, they have, in many cases, been such that the representative himself has apologized for the figures given.

That an industry of the magnitude of that represented by this Association, consuming coal almost exclusively, should not have readily at hand a reliable and accurate estimate of the value of the various qualities of its raw material, is certainly most deplorable, and the author was most forcibly struck with the disadvantages under which both buyer and seller are at present labouring because of this deficiency. This difficulty has existed for many years past; and the only figures relating to coal testing which, as far as the author can ascertain, have hitherto been accepted as universally applicable, are those of Mr. Thomas Newbigging, which have been used and quoted in almost every arbitration or action where coal testing has been brought into question. Since the date Mr. Newbigging's tests were made, however, carbonizing plant has made rapid strides; and although reports relating to the carbonization of the various coals in the old-fashioned iron retorts, worked under the ancient stereotyped system, may in themselves be comparable, they show no comparison whatever with results obtainable under modern conditions of carbonizing.

In spite of the useful work done by the various Gas Associations, one finds that a certain coal may be carbonized at many different works, yet the various engineers will present figures differing very greatly as to the carbonizing results obtained. This difference may possibly be accounted for to a certain extent by the various standards of candle power; but the following considerations are, in the author's opinion, of much greater moment.

A.—The type of ironwork on the different benches.
B.—The different forms of hydraulic mains, &c.
C.—The depth of the seal of the dip-pipes in the hydraulics, and the amount of pressure or vacuum in the foul mains and ascension-pipes.

The depth of the seal and the pressure in the retorts is of the utmost consequence.

In the past, illuminating power was of first importance, bulk was a secondary matter; to-day, one finds the positions almost exactly reversed. Candle power is of but little moment; whereas bulk, even at the expense of candle power, is more to be desired. Artificial illuminants are now the order of the day, and on some works the coal gas is "stretched," and afterwards thickened by the addition of high-grade carburetted water gas, so as to increase its illuminating and calorific powers. Apparently in some cases this is done with considerable success.

Anti-dips, Delamore columns, and retort-house governors have also had their effect, with the result that balance-sheet figures which would, perhaps, in the past have given the gas engineer an approximate estimate of what he might expect from various coals, are now entirely useless in this respect. In the interests of the industry at large, it is desirable that some recognized plant and methods be adopted, together with a new mode of stating the results obtained, so that the figures presented shall be universally comparable.

There appear to be three forms of reports of coal tests before the gas industry. The first (which, fortunately, is rarely met with) is a report of testing on a full-sized working scale; the figures usually given being the make per ton and the candle-power, as recorded in the ordinary daily gas-works operations. The second (a type which is greatly in vogue) is an experimental test with 2·24 lbs. of coal, giving all the figures relating to the gas and residuals obtained from this small sample carbonized in laboratory apparatus. This type is unfortunately the one most frequently met with, and has brought upon coal-testing reports the discredit which they rightly deserve. The third method (which the author believes will bring coal-testing again into favour) is that advocated in the present paper—*i.e.*, testing with full-sized retorts, condensers, purifiers, scrubbers, &c., but in an experimental form specially designed for the purpose. In the author's opinion, this is the only method by which it is possible to obtain the very utmost the coals are capable of yielding; and this condition, surely, is a *sine quâ non*.

In the first case (*i.e.*, testing with an ordinary gas-works employed with one coal exclusively), very misleading results are often obtained. The candle power and the composition of the gas vary very much throughout the day; whereas the candle power, as recorded in the works books, is usually taken during the evening, when the exhauster has been slowed down, and the illuminating power is maintained as high as possible.

The regularity of the times and weights of the charges, the heats of the settings, the levels of the hydraulics, and all other such matters, cannot be given the specialized attention the author considers necessary to obtain the best possible results throughout; and although the results of such tests may be of great service to the operator, they may, for obvious reasons, be most misleading and quite valueless to other engineers.

The author has reports of tests taken at various times at a gas-works employed exclusively with a certain description of coal; widely-varying results being given in each case, as shown by the following figures:—

Cubic Feet per Ton.	Candle Power.	Sperm.	B.T.U.
10,297 ..	14·66 ..	431·30 ..	539·96
10,733 ..	14·76 ..	543·15 ..	539·52
11,138 ..	15·35 ..	586·18 ..	544·28

Of the second type (*i.e.*, carbonizing with 2·24 lbs. of coal) very little need be said. The author's experience has been to show that these tests give a lower make per ton with higher illuminating power than under normal conditions; and even with the most carefully designed of plants, erratic figures are obtained for the residuals.

When the operator has been accustomed to testing some particular grade or kind of coal, the sperm value generally approaches that obtained under proper test conditions; but, in order that acceptable results may be secured, it is imperative that the operator shall be well experienced and the plant carefully designed. The following is a comparison of tests made on a large and a small scale; the same kind of coal being used in both cases:—

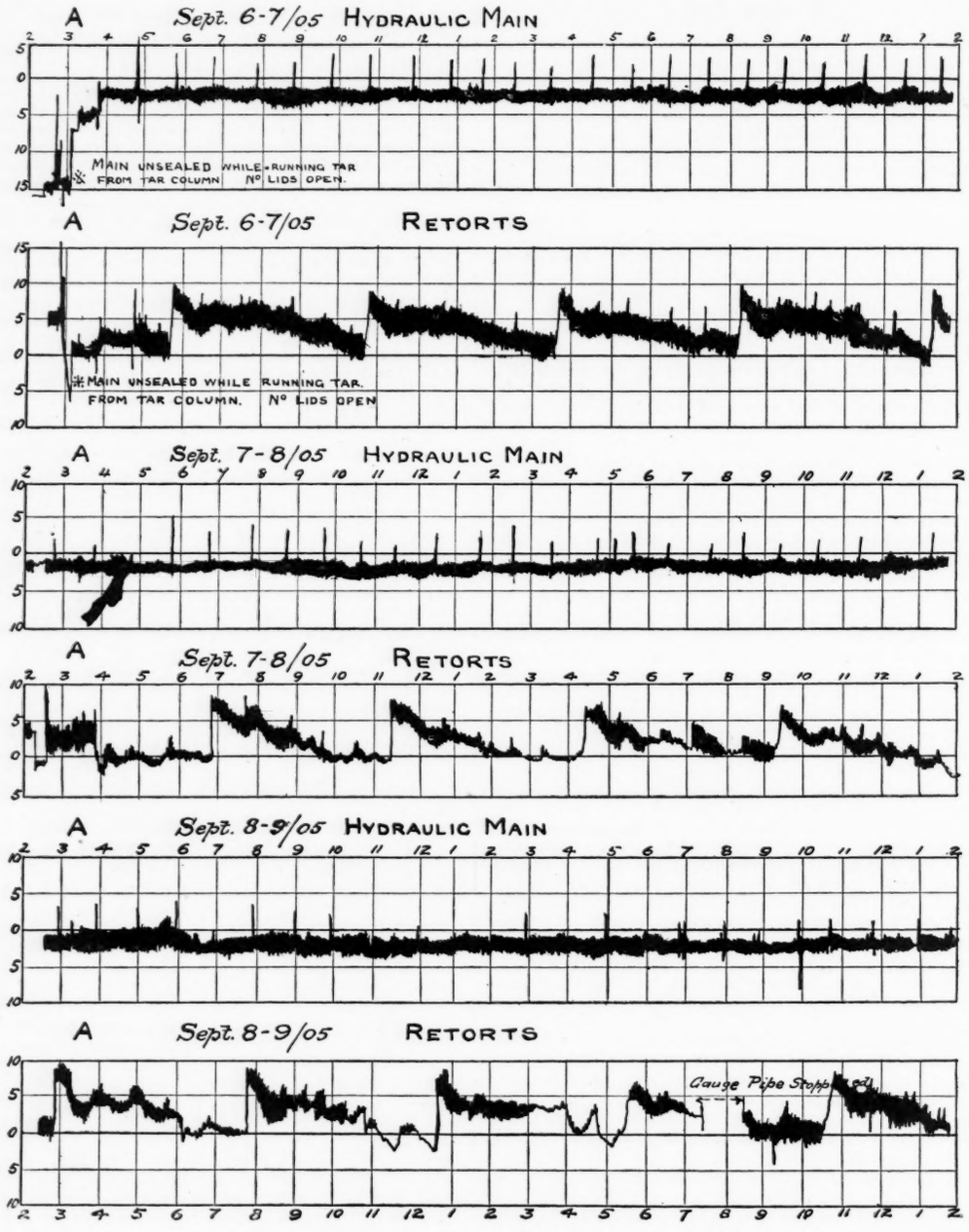
	No. 2 (*a*), 2·24 lbs. per Charge.	No. 3 (*a*), Large Set.
Gas made per ton . . .	9900 cubic feet ..	11,748 cubic feet
Coke made per ton . .	11·89 cwt. ..	12·78 cwt.
Illuminating power . .	16·56 candles ..	15·26 candles
Sperm, per ton . . .	562·1 lbs. ..	614·58 lbs.
Calorific power . . .	678 gross, 617 net ..	639 gross, 578 net
B.T.U. per ton (net) . .	6·008 millions ..	6·787 millions
Specific gravity of gas .	·547 ..	·463

Doubtless many members of this Association have had presented to them by colliery agents similar reports to the test No. 2 (*a*), prepared by public analysts and others inexperienced in the carbonizing of gas coal, who, in their laboratory tests, have probably obtained the very favourable results shown, but which, presented though they be as perfectly *bonâ fide*, are such as would not be accepted by the most inexperienced gas engineer. The author recently had given to him an analysis of 2·24 lbs. of gas coal showing the following results: Gas, 11,660 cubic feet, 18·35-candle power—equal to 733 lbs. of sperm per ton; coke, 12·2 cwt. per ton; sulphuretted hydrogen in crude gas, 0·75 per cent. by volume; and carbonic acid in crude gas, 3 per cent. by volume. But, even when carbonizing this coal under the best possible conditions in a proper testing plant, only 9600 cubic feet of 14·5-candle gas could be obtained.

At times, most extraordinary reports are presented of tests made in this manner—the abnormal results being possibly due in some measure to inaccurate sampling. But, to whatever cause the inaccuracy may be attributed, such results bring great discredit on all concerned. Such testing on a small scale has, however, universally held sway in the past, and has possibly done good service; but to-day's conditions have entirely changed. Sperm value is now of comparatively little consequence, whereas heat value is of supreme importance, and the *desideratum* of the engineer to-day is bulk coupled with high calorific value.

With this end in view, the modern engineer has devised means for avoiding the splitting-up of the gases in the retorts; and, by the use of tar-regulators, Delamore columns, anti-dips, and retort-house governors, he has very materially increased the heat value obtainable from the coal. This being the case, the old reports of tests are of little value to the gas engineer, having been made, in the majority of cases, in order to obtain the highest possible sperm value.

Many may not possibly admit that sperm value and heat value vary greatly according to the different methods of carbonization. Many look upon the advocates of anti-dips, tar-columns, retort-house governors, &c., as cranks and eccentrics. Experience has, however, shown that the introduction of anti-dips, &c., has added greatly to the heat value obtainable; and if examples were needed, one could refer to a London Company selling 12,000 cubic feet of coal gas of a calorific value of about 525 B.T.U. gross and 474 net per ton of Durham coal carbonized. The author has himself


A Sept. 6-7/05 Hydraulic Main
* Main unsealed while running tar from tar column. No lids open.
A Sept. 6-7/05 Retorts
* Main unsealed while running tar from tar column. No lids open
A Sept. 7-8/05 Hydraulic Main
A Sept. 7-8/05 Retorts
A Sept. 8-9/05 Hydraulic Main
A Sept. 8-9/05 Retorts
Gauge Pipe Stopped

obtained in various tests the following exceptionally high yields:—

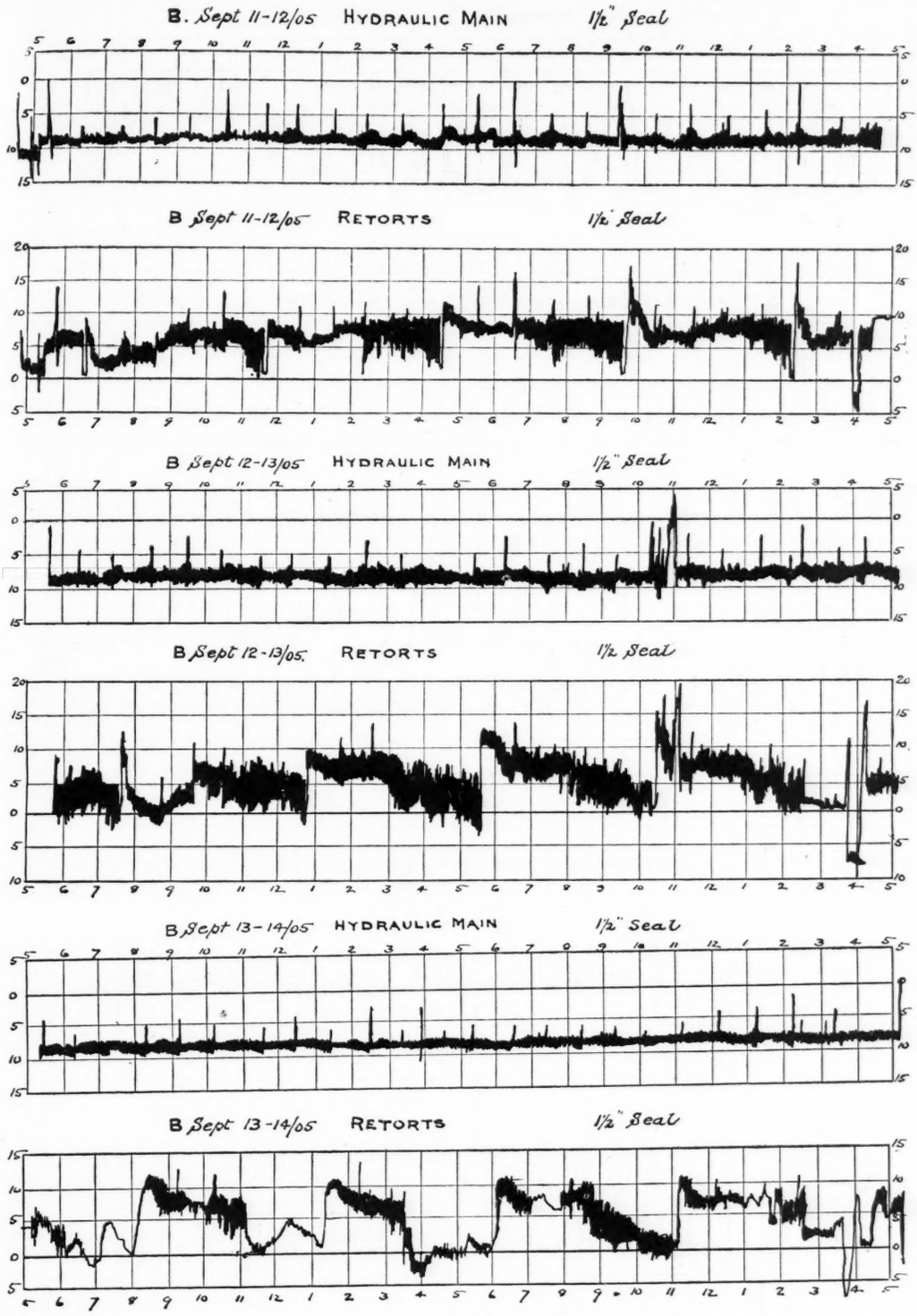
Cubic Feet.	Candle Power.	Calorific Value. Millions of B.T.U. per Ton. Gross.	Net.	Sperm.
12,835	15·98	8·086	7·265	703·2
13,340	12·82	7·390	6·737	586·0
12,966	13·02	7·220	6·494	579·0

These results were obtained in every case from Derbyshire unscreened gas coal; and in one particular case, from Yorkshire coal, the author obtained 14,310 cubic feet of gas of 11·56-candle power, with a calorific value of 534 gross and 473 net B.T.U., and a sperm value of 738 lbs. Doubtless many can give results of even higher yields than these. The time is no doubt rapidly approaching when bulk and calorific value will be the principal considerations; and with perseverance, and further experience in this direction, greater heat value than has hitherto been recorded will certainly be obtainable from the coal.

Seeing that such changes have taken place in the methods of carbonizing, it appears to the author that the conditions of testing should be altered to suit the new requirements, and, in future reports, all the figures and data as to what any particular coal is capable of yielding when subjected to these newer methods of carbonization must be given. The author has here endeavoured to enumerate what these requirements will be—viz., a clear and concise description of the plant used, with full details of the retorts, size, section, length and shape, the type of furnace used in heating the settings, and the average temperature of the retort, a full description of the gas-mains and ironwork, the size of the ascension-pipes, the type of arch-pipes and dips, the depth of seals, description of anti-dip, and the governors used. Full particulars of the exhauster, the washer, scrubber, purifiers, meters, &c.; the position of the tar and liquor tanks, and the methods of estimating the quantities of tar and liquor. The following data must also be given:—

- Duration of test (hours).
- Number of charges.
- Weight per charge (cwt.)
- Total weight.
- Duration of charge (hours).
- Number of retorts working.
- Condition of retorts.
- Gas made (corrected).
- Gas made (per ton).
- Crude gas (per ton).
- Illuminating power (candles).
- Sperm, in pounds per ton.
- Calorific power, gross, net.
- B.T.U. per ton from coal gas, gross, net.
- Crude gas contains—
  - Sulphuretted hydrogen, per cent. by volume.
  - Carbonic acid, per cent. by volume.
  - Ammonia, grains per 100 cubic feet.
  - Sulphur compounds, grains per 100 cubic feet.
- Analysis of purified gas—
  - Carbon dioxide.
  - Hydrocarbons absorbable by bromine.
  - Oxygen.
  - Carbon monoxide.
  - Hydrocarbons of the methane [series.
  - Hydrogen.
  - Nitrogen.
- Hydrocarbons per ton (cubic feet).
- Liquor produced.
- Liquor produced per ton.
- Equivalent in pounds of sulphate of ammonia per ton.
- Tar made (gallons).
- Tar made per ton (gallons).
- Specific gravity of tar.
- Fixed carbon in tar.
- Volatile matter.
- Coke made (total).
- Coke made per ton (cwt.).
- Per cent. ash in coke and analysis of ash.
- Remarks.

In addition to the above, it is essential that a diagram should be submitted, showing the pressures in the retorts themselves,

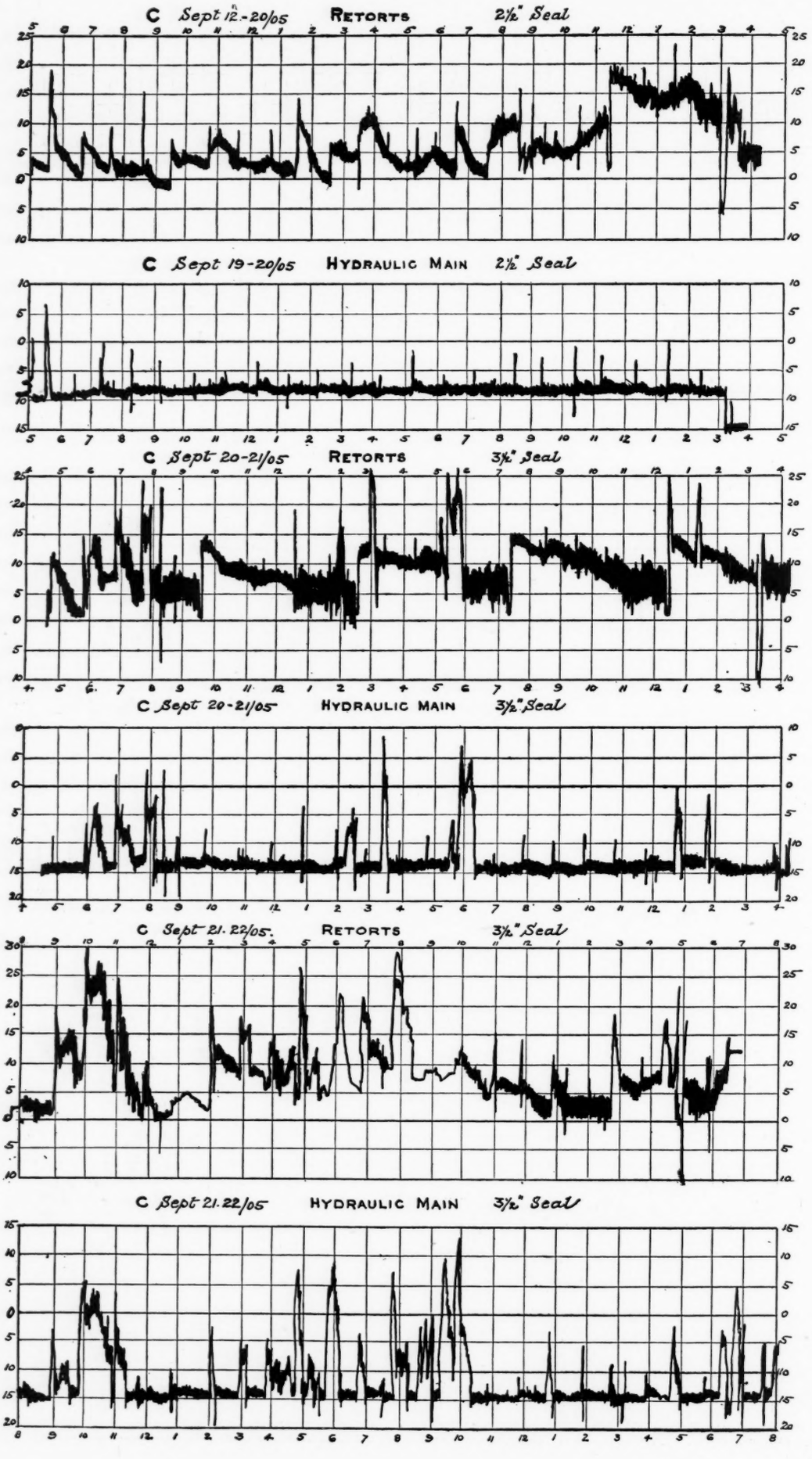

B. Sept 11-12/05 HYDRAULIC MAIN 1½" Seal
B Sept 11-12/05 RETORTS 1½" Seal
B Sept 12-13/05 HYDRAULIC MAIN 1½" Seal
B Sept 12-13/05 RETORTS 1½ Seal
B Sept 13-14/05 HYDRAULIC MAIN 1½" Seal
B Sept 13-14/05 RETORTS 1½" Seal

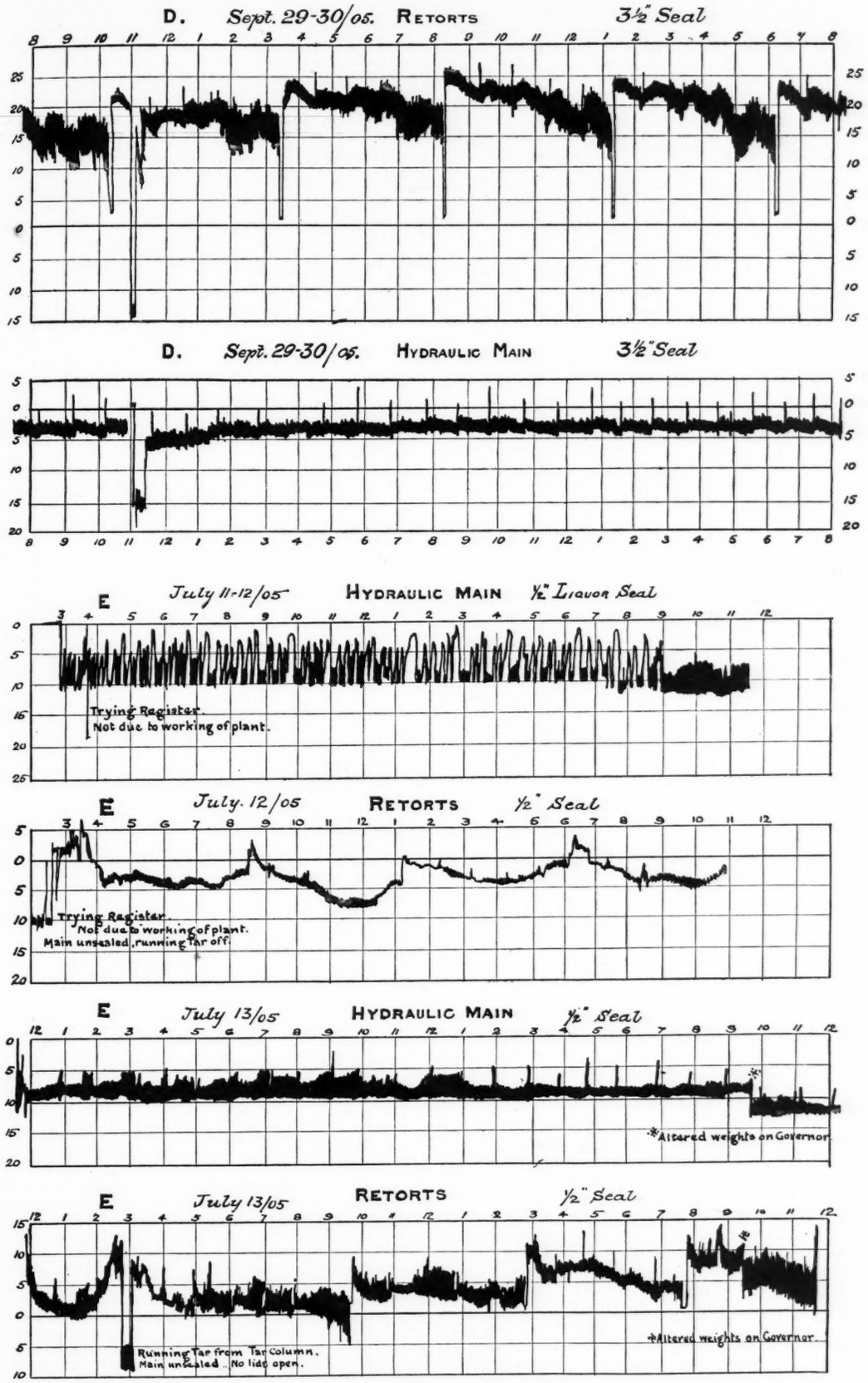
and also in the hydraulic main, throughout the whole period of the test. This item is of the utmost importance.

The author submits herewith a report of a coal test which he considers to be of a desirable and useful form. With such figures relating to several descriptions of coals, a fair and absolute comparison can be made, and it will be noticed that several of the items in the reports check and corroborate each other to a certain extent. It will be seen from the accompanying diagrams and tests of Derbyshire unscreened gas nuts that with Test A there was a seal on the dip-pipes of barely ½ inch, and consequently a very light pressure on the retorts. With Tests B and C, the seals on the dip-pipes were 1½ inches and 3½ inches respectively; but in each case the exhauster was worked with a corresponding vacuum, giving a low pressure on the retorts closely following the pressures obtaining in Test A. The results are shown to be very uniform as regards the yield of gas, illuminating power, and sperm and calorific values. With Test D (made with the same description of coal) there was a seal of 3½ inches and a heavy pressure on the retorts.

Test.	Seal on Dip-Fipes.	Gas per Ton.	Candle Power.	Sperm Value.	Calorific Power.		B.T.Us. per Ton. Net.
		Cubic Feet.	Candles.	Pounds.	Gross.	Net.	Millions.
A.	Barely ½ inch (very light pressure on retorts).	11,748	15·26	614·58	639	578	6·787
B.	1½ inches (vacuum to correspond—low pressure on retorts).	12,116	14·76	612·90	617	533	6·395
C.	3½ inches (ditto).	12,101	14·39	597·11	616	552	6·683
D.	3½ inches (heavy pressure on retorts).	10,007	15·50	531 80	625	561	5·614

There is thus shown a drop of 2000 cubic feet of gas per ton,


C Sept 12-20/05 RETORTS 2½" Seal
C Sept 19-20/05 HYDRAULIC MAIN 2½" Seal
C Sept 20-21/05 RETORTS 3½" Seal
C Sept 20-21/05 HYDRAULIC MAIN 3½" Seal
C Sept 21.22/05 RETORTS 3½" Seal
C Sept 21.22/05 HYDRAULIC MAIN 3½" Seal


D. Sept. 29-30/05. Retorts 3½" Seal
D. Sept. 29-30/05. Hydraulic Main 3½" Seal
E July 11-12/05 Hydraulic Main ½" Lisavon Seal
Trying Register.
Not due to working of plant.
E July. 12/05 Retorts ½" Seal
Trying Register.
Not due to working of plant.
Main unsealed, running Tar off.
E July 13/05 Hydraulic Main ½" Seal
*Altered weights on Governor.
E July 13/05 Retorts ½" Seal
Running Tar from Tar Column.
Main unsealed. No lids open.
*Altered weights on Governor.

with a slight increase in candle power and a reduction of 70 lbs. to 80 lbs. of sperm equivalent per ton.

The calorific value per cubic foot of gas is practically the same as in the cases of A, B, and C; but the total heat value obtained from the coal is reduced by about a million B.T.U. per ton.

This shows very conclusively the great advantage obtained by working with a low pressure in the retorts and the hydraulic main. It also shows the necessity, where a reliable and accurate comparison of various descriptions of coal is required, of having the pressures under absolute control, so that the tests may be made under uniform or varied conditions, as may be required.

If the whole of the particulars as to the sizes and descriptions of plant and apparatus are reported, and automatic records of pressures are taken, the exact conditions under which the test has been made will be readily seen, and the reported results will be of service both to the buyer and the seller.

The author also submits a test (E) of a first-class cannel, giving all the particulars advocated in the present paper.

TEST A.—*Unscreened Gas Coal.*

—	Sept. 6-7.	Sept. 7-8.	Sept. 8-9.	Averages.
Duration of test	24 hours	24 hours	24 hours	
Number of charges	48	48	48	
Weight per charge	2¼ cwt.	2¼ cwt.	2¼ cwt.	
Total weight	5 tons 8 cwt.	5 tons 8 cwt.	5 tons 8 cwt.	
Charges worked off in	5 hours	5 hours	5 hours	
Condition of retorts	Very good working heat	Very good working heat	Very good working heat	
Gas made (corrected), c. ft.	60,991	63,985	65,348	Gas per Ton.
,, per ton ,,	11,295	11,849	12,101	11,748
Crude gas ,, ,,	11,514	12,033	12,310	11,952
Illum. power of gas, candles	15·34	15·33	15·11	15·26
Sperm, lbs. per ton	594·05	622·78	626·9	614·58
Calorific power of gas	652–591	639–578	625–565	639–578
B.T.U. per ton net, millions	6·675	6·849	6·837	6·787
Crude gas contains H_2S p.ct.	0·7	0·6	?	0·7
Crude gas contains CO_2 ,,	1·2	1·1	0·76	1·0
Crude gas contains O ,,	2·2	2·6	2·0	2·3
NH_3 per 100 c. ft., grs.	80·56	57·00	?	69·0
Sulph. cmpds. ,,	13·73	22·01	36·73	say 24
Purified gas, sp. gr.	·476	·456	·456	·463
Analysis—				
CO_2	1·4	0·8	1·0	1·1
O	1·1	1·3	1·8	1·4
C_nH_m	4·1	3·9	4·0	4·0
CO	8·4	7·8	8·8	8·3
CH_4 series	27·5	26·3	25·9	26·5
H	50·3	54·3	52·5	52·4
N	7·2	5·6	6·0	6·3

	Total for Three Days.	
Coke made	9 3 0	
Breeze ,,	0 11 3	
Dirt ,,	0 12 1	
Bats ,,	0 0 0	Coke. 12·78 cwt. per ton.
Total residue	10 7 0	
Quality of coke	0·7	
Ash in coke, per cent.	5 24	
Tar made, galls.	257	Tar. 15·87 galls. per ton.
,, per ton, galls.	15·87	
Sp. gr. of tar	1·130	
Fixed carbon in tar, per cent.	22·27	
Volatile matter, ,,	66·73	
Liquor made, galls. 10 oz	356	Liquor. 18·52 lbs. S.A. per ton.
,, per ton, galls. 10 oz.	22	
S.A. per ton equivalent, lbs.	18·52	

Analysis of ash from coke—

SiO_2	45·92 per cent.
CaO	18·19 ,,
MgO	3·97 ,,
Fe_2O_3	14·45 ,,
Al_2O_3	14·59 ,,
Alkalies	2·17 ,,
SO_4	0·56 ,,
	99·85 per cent.

Seal on dip pipes, barely ½-inch.

Coal, bright shining black. Contains a few thin layers of charcoal in the plane of stratification. Fracture cubical, with a few laminæ of carbonate of lime and traces of sulphide of iron. Cross fracture irregular, showing a bright resinous surface. Streak reddish brown. When heated, the coal fuses and swells up considerably; and when burnt completely away, it leaves a light brown ash. Percentage of ash in coal, 3·28.

Very light Seal—Very light Pressure on Retorts.

Weights per Ton.

Gas	437 lbs.
Coke	1432 ,,
Tar	179 ,,
Liquor	225* ,,
H_2S	14 ,,
CO_2	7 ,,
CS_2 and CN (say)	6 ,,
Total	2300 lbs.

* Includes water used in washing.

Discussion.

Mr. FLETCHER STEVENSON (Coventry) thanked Mr. Brown for his paper, which, he said, had been extremely interesting, and was on a most important matter. But it was a very difficult thing for all gas-works to carry out coal testing. Mr. Brown advocated a full-scale plant absolutely throughout. Perhaps he would more fully explain this; but he (the speaker) took it that what Mr. Brown meant was one full-sized clay retort, or portion of clay retort, with the exact counterpart of the plant in a gas-works. This meant that the retort must always be kept at work on testing if it was to be of any use, and only large works could do coal testing on those lines. It was because of this that the smaller plants had come into use. They had all felt—even those of them in charge of the smallest works—that it was necessary to have some test of the coal being supplied to them. They could not continue testing in one retort or in a single bed of retorts, with proper results, in a small works; and therefore they had to adopt a much smaller scale plant. He quite agreed that the 2·24 lbs. was almost useless, but yet it did give some comparison between different samples, and it was a little guide in purchasing altogether fresh coals. If medium-sized works were to have coal-testing plant on a working scale, it seemed to him, instead of having a full sized clay retort and all the plant exactly the same, it might be on a reduced scale—the retort being of cast iron, and lined with fire-clay. This was the plan that was used even in some large gas-works. Manchester, for instance, a few years ago, had this type of coal-testing apparatus. At Sheffield, too, they had coal-testing apparatus always going. It consisted of three iron retorts charged—he was speaking from memory—with 4 cwt. of coal among the three. This was kept going the year round, excepting when the retorts burnt out, and then another bed was lighted up. This, however, was a system that could only be kept going on large works. Therefore the majority of them had to depend very much on the small scale plant. Again, he should like to say that, desirable as it was to have these tests made on a full working scale, the next best thing (though Mr. Brown thought so poorly of it) was to have a few days' or a week's run on a particular coal. And then, though they had the apparatus in usual working order, they could get better results because everybody was on the *qui vive*, and looking after things a

TEST B.—*Unscreened Gas Coal.*

—	Sept. 11-12.	Sept. 12-13.	Sept. 13-14.	Averages.
Duration of test	24 hours	24 hours	24 hours	
Number of charges	48	48	48	
Weight per charge	2¼ cwt.	2¼ cwt.	2¼ cwt.	
Total weight	5 tons 8 cwt.	5 tons 8 cwt.	5 tons 8 cwt.	
Charges worked off in	5 hours	5 hours	5 hours	
Condition of retorts	Very good working heat	Very good working heat	Very good working heat	
Gas made (corrected) c. ft.	65,569	65,900	64,800	
,, ,, per ton ,,	12,143	12,204	12,000	12,116
Crude gas ,, ,,	12,403	12,517	12,183	12,368
Illum. power of gas, candles	14·80	14·41	15·06	14·76
Sperm, lbs. per ton	616·17	602·95	619·6	612·9
Calorific power of gas	635–572	606–544	609–550	617–533 gross net
B.T.U. per ton, millions	6·946	6·639	6·50	6·395
Crude gas contains—				
H_2S p. ct.	0·6	?	0·7	0·7
CO_2 ,,	1·5	1·8	0·8	1·4
O ,,	2·2	2·0	3·0	2·4
NH_3 per 100 c. ft., grs.	26·2	17·1	..	..
Sulphur compounds, per 100 c. ft., grs.	13·11	9·05	12·5	11·55
Purified gas analysis—				
Sp. gr.	·434	·444	·444	·441
CO_2 p. ct.	1·4	1·2	1·0	1·2
O ,,	0·6	1·8	1·7	1·4
C_nH_m ,,	2·6	3·4	2·8	2·9
CO ,,	8·8	7·8	8·5	8·4
CH_4 series ,,	29·4	27·5	28·0	28·3
H ,,	50·8	52·7	52·8	52·1
N ,,	6·4	5·6	5·2	5·7

	Total for Three Days.	
Coke made	8 9 0	
Breeze ,,	0 19 0	
Dirt ,,	0 7 2	
Bats ,,	0 0 0	Coke. 12·07 cwt. per ton.
Total residue	9 15 2	
Quality of coke	0·7	
Ash in coke, per cent.	5·24	
Tar made, galls.	221·00	Tar. 13·64 galls. per ton.
,, ,, per ton, galls.	13·64	
Sp. gr. of tar	1·150	
Fixed carbon in tar, per cent.	32·25	
Volatile matter ,, ,,	66·75	
Liquor made, galls. 10 oz.	385·00	Liquor. 20·04 lbs. S.A. per ton.
,, ,, per ton, galls. 10 oz.	23·8	
S. A. per ton equivalent, lbs.	20·04	

Seal on dip-pipes, 1½ inches. Vacuum to correspond, giving a low pressure on retorts.

Analysis of ash from coke, see Test A.

1½-inch Seal — Light Pressure on Retorts.

Weights per Ton.

Gas	429 lbs.
Coke	1352 ,,
Tar	157 ,,
Liquor	224* ,,
H_2S	7 ,,
CO_2	20 ,,
CS_2 and CN, say	7 ,,
Total	2196 lbs.

* Includes water used for washing.

TEST C.—*Unscreened Gas Coal.*

—	Sept. 19-20.	Sept. 20-21.	Sept. 21-22.	Averages.
Duration of test	24 hours	24 hours	24 hours	
Number of charges	48	48	48	
Weight per charge	2¼ cwt.	2¼ cwt.	2¼ cwt.	
Total weight	5 tons 8 cwt.	5 tons 8 cwt.	5 tons 8 cwt.	
Charges worked off in	5 hours	5 hours	5 hours	
Condition of retorts	Very good working heat	Very good working heat	Very good working heat	
Gas made (corrected) c. ft.	63,972	66,200	65,868	
,, per ton ,,	11,847	12,259	12,198	12,101
Crude gas ,, ,,	12,101	12,586	12,408	12,368
Illum. power of gas	13·86	14·30	15·00	14·39
Sperm, lbs. per ton	562·97	601·04	627·32	597·11
Calorific power of gas	600–531	614–555	634–570	616–552
B.T.U. per ton, millions	6·291	6·804	6·953	6·683
Crude gas contains—				
H_2S p. ct.	0·9	0·6	1·2	0·9
CO_2 ,,	1·2	2·0	1·3	1·5
O ,,	1·7	1·8	1·3	1·6
NH_3 per 100 c.ft., grs.	55·6	40 9	39·3	45·3
Sulphur compounds, per 100 c. ft., grs.	..	23·66	19·22	..
Purified gas analysis—				
Sp. gr.	·482	·439	·444	·455
CO_2 p. ct.	0·6	0·8	1·2	0·9
O ,,	0·8	1·4	1·2	1 1
C_nH_m ,,	3·0	3·1	3·1	3·1
CO ,,	8·6	9·5	8·5	8·9
CH_4 series ,,	27·8	21·8	31·2	26·9
H ,,	53·2	53·8	52·8	53·3
N ,,	6·0	9·6	2·0	5·8

	Total for Three Days.	
Coke made	9 11 2	Coke, 12·85 cwt. per ton.
Breeze ,,	0 10 3	
Dirt ,,	0 6 0	
Bats ,,	0 0 0	
Total residue	10 8 1	
Quality of coke	0·7	
Ash in coke, per cent.	5·24	
Tar made, galls.	207·00	Tar. 12·78 galls. per ton.
,, ,, per ton, galls.	12·78	
Sp. gr. of tar	1·15	
Fixed carbon in tar, per cent.	25·62	
Volatile matter ,, ,,	74·38	Liquor. 20·11 lbs. S.A. per ton.
Liquor made, galls. 10 oz.	387·00	
,, ,, per ton, galls. 10 oz.	23·89	
S.A. per ton equivalent, lbs.	20·11	

Seal on dip-pipes, 3½ inches. Vacuum to correspond, giving a low pressure on retorts.
Analysis of ash from coke, see Test A.

3½-inch Seal — Light Pressure on Retorts.

Weights per Ton.

Gas	429 lbs.
Coke	1439 ,,
Tar	147 ,,
Liquor	235* ,,
H_2S	12 ,,
CO_2	16 ,,
CS_2 and CN	7 ,,
Total	2285 lbs.

* Includes water used for washing.

TEST D.—*Unscreened Gas Coal.*

	Sept. 29-30.
Duration of test	24 hours
Number of charges	48
Weight per charge	2¼ cwt.
Total weight	5 t. 8 c.
Charges worked off in	5 hours
Condition of retorts	Very good working heat.
Gas made (corrected)	54,037 c. ft.
,, ,, per ton	10,007 ,,
Crude gas ,,	10,180 ,,
Illuminating power of gas	15·50 cand.
Sperm, per ton	531·80 lbs.
Calorific power of gas	625 gross 561 net B.T.U.
B.T.U. per ton, millions	5·614
Crude gas contains—	
H_2S	0·8 p. ct.
CO_2	0·9 ,,
O	2·2 ,,
NH_3 per 100 c. ft.	48·4 grs.
CS_2 ,, ,,	19·9 ,,
Purified gas—Analysis—	
Specific gravity	0·456
CO_2	1·0 p. ct.
O	1·8 ,,
C_nH_m	3·7 ,,
CO	8·8 ,,
CH_4 series	33·8 ,,
H	44·3 ,,
N	6·4 ,,
	t. c. q.
Coke made	3 2 2
Breeze ,,	0 5 2
Dirt ,,	0 2 3
Bats ,,	0 0 0
Total residue	3 10 3
Quality of coke	0·7
Ash in coke, p.ct.	5·24
Tar made	85·7 galls.
,, ,, per ton	15·87 ,,
Specific gravity of tar	1·185
Fixed carbon in tar	38·20 p.ct.
Volatile matter ,, ,,	61·80 ,,
Liquor made	130 galls.
,, ,, per ton	24·07 ,,
S.A. per ton equivalent	20·27 lbs.

Seal on dip-pipe, 3½ inches. Heavy pressure on retorts.
Analysis of ash from coke, see Test A.

3½-inch Seal — Heavy Pressure on Retorts.

Weights per Ton.

Gas	355 lbs.
Coke	1467 ,,
Tar	188 ,,
Liquor	247* ,,
H_2S	7 ,,
CO_2	10 ,,
CS_2 and CN	7 ,,
Total	2281 lbs.

* Includes water used for washing.

little better than usual. They could take their samples of gas, analyze and test them for illuminating power, and not only in the evening, as Mr. Brown suggested, but right through every hour of the day. The night was missed very often; but they could get a very fair average in this way of the gas made in the plant at disposal. In medium sized and small works, this was absolutely the only way they could make tests of coal. Of course, at such places as Nottingham and other big towns, it was very desirable that these tests should be made, and, as Mr. Brown had pointed out, every minute detail given. But those in other and smaller works did not see these results, and did not get them. The big gas-works were very chary about giving out the results of their analyses, as they might get into the hands of colliery people, and then be hawked round. He thought the best test for them was the working test (say) for a week under ordinary conditions.

Mr. G. HELPS (Nuneaton) said he was particularly interested in the paper. A good deal in it, however, he did not agree with. If they took similar coals—coking coals—throughout the country, in the commercial result there would be very little difference between them. [Cries of "Question."] He meant in a test over twelve months, and taking the result shown in the balance-sheet. Residuals, of course, formed a very important factor in judging a coal. That was his experience of it. In connection with the coals he had used in the district, he had never been able to find there was any very huge difference in them except in the matter of price. The cheapest coal in his experience was that which would give the best profit on the year's working. He saw that Mr. Brown called attention to different works getting different results. He (Mr. Helps) had heard the same remark in the room before. A good deal of it was caused by carbonizers decomposing the gas in various ways. This was a matter that would perhaps be dealt with one of these days by someone who had taken the temperatures, and who was able to deal with this part of the subject. He saw that Mr. Brown called particular attention to giving the type of the ironwork on different benches. But they could hardly compare ironwork and things of that kind, while they could compare the analysis of one man's gas with that of another. Of course, it was quite true what Mr. Brown said about a good many people "stretching" gas; and they stretched other things besides gas. [Laughter.] There was another matter he could not really understand Mr. Brown referring to in these days—that was, comparing the value of coal in so many pounds of sperm. Coal was not sperm. They wanted some cubic feet and British thermal units out of it. It was very misleading to go into the sperm value of coal. Mr. Brown gave some huge results in the paper—for example, 13,300 and 12,900 cubic feet of gas per ton of coal carbonized. He (Mr. Helps) had known such results to be obtained before; and he knew something about the analysis of the gas when figures of this kind were secured. He noticed, however, that Mr. Brown did not give them an analysis of his gas.

Mr. B. W. SMITH (Walsall) congratulated Mr. Brown upon the enormous amount of trouble he had taken in preparing the paper, and to give the members so much information as he had done. He thought he could claim having had, if not more, probably quite as much experience in testing coal as most engineers in the room. He had also tested coal in small quantities and in bulk; and it did not matter where they might send the coal, they were bound to have varying conditions from causes that Mr. Brown

TEST E.—*First-Class Cannel.*

.....CANNEL.
To the ..... Colliery.

The following is a report on the above-named cannel, which has been tested on a working scale with full-sized average gas-works plant.

The plant used was a bed of retorts 18 ft. 6 in. long, 21 in. by 15 in. Ω section, heated by direct-fired furnaces. The retort mouthpieces are fitted with 6-inch ascension-pipes on one side and 7-inch on the other. The hydraulic main is of the ordinary type, fitted with a Delamore tar-column.

Throughout the test the seal of the dip-pipes was adjusted to a perfectly regular ½-inch liquor seal.

The exhaust pressure was controlled to the finest possible adjustment by an efficient retort-house governor, and a perfectly constant vacuum was maintained in the hydraulic mains throughout the 48 hours. 24-hour pressure diagrams were taken on both days, to show the pressure actually existing in the retorts and the hydraulic mains. These are enclosed herewith.

The cannel is of the bastard type, pitchy black in colour, and of a resinous appearance. It contains a few streaks of bright black coal along the plane of stratification, but is with difficulty separated into layers in the plane; contains slight traces of sulphide of iron.

Principal fracture: Breaks into flat planes.
Cross fracture: Irregular and conchoidal.
Streak: Reddish brown.

On heating, the cannel fuses and cakes into a very hard close-grained coke of a dull grey appearance.

It produces a very large quantity (12,453 cubic feet) of very good gas (17·84 candles, 697/632 calorific power) suitable for enriching. The sperm yield per ton is 762 lbs.

The coke yields a small percentage of ash (7·13 per cent.), and is very suitable for all purposes. It is especially suited for use in water-gas generators, yielding a rich gas, and producing thin, friable clinker on the bars.

The coal can be mixed with coking coals for the production of a medium gas coke.

Duration of test	48 hours
Weight of material	10 t. 16 c.
Duration of charges	5 hours
Number ,,	96
Gas produced (corrected)	134,493 c. ft.
,, ,, per ton (corrected)	12,453 ,,
Illuminating power	17·84 cand.
Sperm, per ton	761·70 lbs.
Specific gravity	0·503
Impurities—	
Sulphur compounds per 100 c. ft.	19·45 grs.
Ammonia per 100 c ft.	111·00 ,,
Sulphuretted hydrogen	2·50 p. ct.
Carbonic acid	1·70 ,,
Oxygen	2·05 ,,
Calorific power of gas	697 gross / 632 net
Net B.T.U. per ton	7·87 millions
Coke produced	6 t. 8 c.
,, ,, per ton	11·85 cwt.
,, used for heating retorts	5·93 ,,
,, percentage of ash	7·13
Quality compared with standard (1)	0·6
Tar produced	242 galls.
,, ,, per ton	22·40 ,,
Specific gravity	1·195
Fixed carbon	32·47 p. ct.
Liquor produced	190 galls.
,, ,, per ton	17·59 ,,
Strength	10 oz.
Virgin liquor per ton	12·96 galls.
Sulphate of ammonia per ton	14·82 lbs.

Remarks.

Purified gas: CO_2, 1·8 p. ct.; O, 1·3 p. ct.; C_nH_m, 6·6 p. ct.; CO, 7·6 p. ct.
Retorts: Very good working heat.
Seal: ½ inch liquor.
Coke made: 6 tons 8 cwt.

Analysis of Ash from Coke.

Silica (SiO_2)	25·33 per cent.
Lime (CaO)	3·90 ,, ,,
Magnesia (MgO)	trace.
Ferric oxide (Fe_2O_3)	62·73 ,, ,,
Alumina (Al_2O_3)	7·67 ,, ,,
	99·63

had pointed out. No two gas-works being on the same footing in regard to carbonizing got the same results; and he thought the most economical way for an engineer to get results himself was to make a test in bulk. Laboratory tests were a very good comparison between one coal and another, if the conditions were uniform. With regard to the sperm value, the multiple was an absolute necessity so as to compare one gas with another—the illuminating power and also the make per ton; and if it was not given, it was a difficult thing to jumble the whole of the residuals together with the illuminating power, and arrive at the value, because the higher the heats in one works, the less the tar produced, and also the less the ammoniacal liquor. The cause of the burnt gas which so many people thought was produced by decomposition in the retorts was invariably due to the decomposition of the tar forming inside the retort in the first portion of the carbonization; and this was the explanation of the very erroneous impression abroad among them as to the decomposition of gases.

Mr. HAROLD E. COPP (West Bromwich) said the paper was characteristic of the thoroughness with which Mr. Brown tackled everything he went into. Of course, everybody would probably acknowledge that it was desirable to have a testing plant on a working scale, but that, of course, was beyond the reach of the majority of the undertakings represented by gentlemen in the room. Therefore he said the next best thing was to have a small testing plant. Of course, they had heard a lot about the errors that were generally associated with the use of this plant; but not being in the fortunate position of being able to test on the working scale—except by using the same coal on several consecutive days—he had himself been reduced to the small experimental plant. This being so, he endeavoured to imitate the working conditions with his small plant. He found that one of the greatest sources of errors was the fact that the temperatures were uneven. If they could control the temperature in the experimental retort, they had taken the first step in the right direction. This could be easily done by means of a pyrometer or temperature recording cone, and then the pressure could be easily regulated and watched so as to preserve an absolutely even gauge in the retort during carbonization. Of course, he admitted that the small plants were absolutely useless so far as the residuals were concerned. They could not get to anything like reliable information as regards the quality or the quantity of the residuals. Another source of error was in the sampling. In a large plant, they had a better chance of getting a sample than in a small one. In the latter, it was a laborious business to get hold of a true sample. It generally took nearly as long as doing the test itself. Notwithstanding, for his own part, he would rather have his own test, knowing there was some error between that and the working test; for, when they had established the relationship between the two, he thought it was much more valuable to each engineer to have his own test, and to subject all his coals to the same process.

Mr. BROWN, in reply, said Mr. Stevenson had evidently made some mistake, and Mr. Copp had followed him, in his reference to the testing. As he (Mr. Brown) had suggested, the testing was made on a full-sized working scale on one bed of retorts. If they were working on five-hour charges, they worked a bed of fives; if they worked on six-hour charges, they worked on a bed of sixes, in one of the large retort-houses. They could take the gas from that one bed; and then lead it from that bed into a small complete gas-works.

Mr. STEVENSON: That is practically what I said. I think you said one retort or setting?

Mr. BROWN said the point was that with one retort they got a charge worked off at the end of five hours. During the fourth or fifth hour, the gas was very thin; whereas if they worked (say) six retorts with six-hour charges, they had through the six-hour charge a regular stream of constant quality gas.

Mr. STEVENSON: That emphasizes what I said. It is a working-scale plant; and a working-scale plant is too large for a medium-sized works, though very handy for a big works.

Mr. BROWN said, in further answer to Mr. Stevenson and Mr. Copp, the idea in bringing his paper forward was not with regard to deliveries from bulk under contract, but to come to some constant, so that the Engineer at Coventry (say) might see what a certain coal used at Nottingham was worth to him. The coal merchant would offer them a test which would give no idea of what the coal was yielding. Testing as they did in one bed of through retorts, and keeping the house constantly at work, they could change over from one set to another, and find them in good condition. Their object had been to obtain the utmost that it was possible to get out of the coal. He could not agree with Mr. Helps that they could obtain the same results from any two coking coals working throughout the twelve months. With regard to the sperm value, there were unfortunately parliamentary standards, and different gas engineers had to comply with these standards; and therefore the sperm value was of use in those cases. With reference to the large yields shown here, this was not an unimportant matter. Various coals under this new process they found would stand what they called "breaking-down the sperm." With one coal particularly, they obtained a yield of 14,000 cubic feet of 8-candle gas; and the sperm remained the same whether they got 14,000 or 9000 feet of gas. As the candle power went down, the increase in gas went up. The reverse was also the case. This was only discovered by testing the coal in this way. Some coal would stand this breaking-down; others would not. It was only by making consecutive tests that they would be able to present to an engineer what a coal that he was using would do in his particular works.

Institution of Gas Engineers.

We are informed by the Secretary (Mr. Walter T. Dunn) that the Council have arranged that the next annual general meeting of the Institution of Gas Engineers—which is to be held in London—shall take place from Tuesday, June 19, to Friday, June 22, 1906. Members of Affiliated Associations desiring to join the Institution under the provisions of the new regulations, whereby they are exempted from payment of entrance fees, are reminded that their forms of applications should be received at the Office of the Institution, No. 39, Victoria Street, Westminster, by the end of next month (November).

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Gas Pressure—Light Measurement.

The Opening Meeting of the London and Southern District Junior Gas Association for the present session was held last Friday under the presidency of Mr. Walter Grafton.

At the opening of the proceedings, the President said that the awards made by the ballot by the Council for the best and second best papers of last session had fallen as follows: The first prize (value £2 2s.) to Mr. W. E. Dean, for his paper on "Boosting;" and the second prize (value £1 1s.) to Mr. W. Upton, for his contribution entitled "Notes by the Way."

Gas Pressure.

The President then said he would like to make a few remarks with regard to the question of pressure. They were at the present time in a transition state, inasmuch as they were going from one method of valuing their commodity to another; and while he did not intend to say much upon that, he wanted to dwell a little on the results of what was termed the Stevens Act which had been passed in New York. Under this Act, the maximum pressure of illuminating gas in any service-mains in the city is not allowed to exceed 2½ inches; while the minimum pressure must not fall below 1 inch. He hoped that such provisions would never come into force in this country, because to maintain 2½ inches maximum was impossible, if the consumers were to be supplied with a proper light. There must be sufficient pressure not only in the vicinity of the works but at all parts, especially those most remote from the source of supply. Service-mains must not be confounded with supply-mains, which latter were generally under the higher pressure it was thought necessary now-a-days to provide consumers with; but everything depended on the uses the consumer required the gas for, as to whether his business might not be the cause of much of the variation in the pressure supplied. That pressure might not be adequate in his service to meet a sufficient draught or pull upon the volume; and consequently any such sudden demand required a much heavier pressure to insure efficient service without any great reduction in pressure. If the supply were low, the gas was at once condemned as poor, bad, or at least indifferent. It might be the constitution of the gas, for he had found that some flat-flame burners to pass 5 cubic feet per hour required 3 inches pressure, or ½ inch more than the New York maximum, to yield the best duty. It would shortly become law in London that gas must be burned at 5 cubic feet per hour; and it was only reasonable that the consumer should have a 5 cubic feet light. This he could not always have with less than 3 inches pressure. A pressure of 2½ inches on a constant volume of gas was one thing; but a pressure of 2½ inches on a flowing stream was quite different. They might say that governors on the service would make this right; but he would ask them to consider during the session, in connection with their own work, whether it were not a fact that governors were only so by name, and not by nature, if a certain pressure were absent. They could have a pressure on the inlet of a governor of 2½ inches; while on the outlet it might be only $\frac{1}{10}$th. Where they had 2½ inches on the inlet, it did not follow that they were getting 2½ inches rate of gas. In the case of high-pressure lighting, they would at times have perhaps on their intensifiers or govenors 20 inches pressure; but this would vary considerably, and therefore they found it necessary to tone it down to 8 or 10 inches, or less, to ensure it keeping constant. It was always necessary that on the inlet of the governor or reducer the pressure should be greatly in excess of what was wanted. How, then, could it be possible for a 2½-inch service supply to meet requirements, when a flat-flame burner needed in many cases 3 inches if it were to consume 5 cubic feet? A cooker required at the least 2½ inches pressure maintained. They might test the services and find that they had this pressure; but when the taps had been opened and the cooker lighted, this would have dropped to about ½ inch. From the consumers' point of view, the pressure must be at least 5 inches to get good all-round results. Now that they were coming to a very enlightened method of dealing with their commodity, it was necessary to augment the pressure. Many places might have 6, 7, 8, or 9 inches on the works; but, on the other hand, in the district they probably would not get more than 1½ or 2 inches. He would like the members to take this question into consideration, both with regard to service governors and the governors on the brackets. They would find that, to get the proper quantity passed, and so satisfy the consumer, they would require more than a maximum of 2½ inches pressure. No wonder a great fuss had been made about the difficulty of working under this pressure.

Measurement of Artificial Illumination.

This was the title of a paper which was then read to the members by Mr. E. E. Grimwood, in which the author confined himself to the branch of the subject treating of comparison screens, which he argued were the most important part of the photometer. Much of the paper was historical; the principle of the earliest photometer—that of Bouguer—being explained, as well as the ideas governing subsequent inventions. The Bunsen screen, said the author, was one of the best known and most used of all industrial forms, and dated from the year 1841. Its marked simplicity admirably adapted it for use in the laboratory. In its simplest form, it consisted of a disc of white opaque paper, which had been rendered semi-transparent over a certain portion by greasing with some suitable material—usually spermaceti. The actual screen introduced by Bunsen had a grease spot in the centre of the paper; but those in most general use at the present time were made the reverse way—*i.e.*, a circle of plain paper in the centre, surrounded by a greased surface. The line of separation between the greased and ungreased parts was a matter of great importance. Bunsen's disc or screen was based upon the following principle: When it is held up to a light in such a position that it is between the light and the eye, the greased portion appears bright. If now it is placed behind the light, it appears dark; the plain ungreased portion in the centre being exactly the reverse in each case. Consequently, if the disc be equally illuminated on both sides, the previously mentioned cases should be neutralized one by the other, and it should appear practically as a plain piece of paper. Attention having been drawn to the difficulties overcome by Messrs. Simmance and Abady's Photosphene—in which screen the author said the edge was quite sharp, and being therefore free from shadow when the lights were equal, a perfectly plain surface was observed—some remarks were made on colour photometry.

Up to the past twenty or thirty years, all artificial illuminants were, Mr. Grimwood pointed out, of practically the same colour; but since that time various styles had been introduced which varied considerably in this respect. For instance, there were the Welsbach mantle, the electric arc, the flame arc, and the mercury vapour lamp; and to find a means of comparing such lights as these had been the aim of scientists of late years. The first man to think out an idea to attain this end seemed to be Rood, who introduced the principle of the Flicker about 1892; the idea being to display before the eye for an equal space of time the rays from the two sources alternately in quick rotation. Rood's method of accomplishing this was as follows: A triangular prism, carefully made of plaster of paris, so that the apex is reduced to a knife edge, is fixed on a board. In front of this is a concave lens, mounted on the top of an oscillating bar in such a manner that it moves to and fro within scope of the prism. This is observed through a tube of about 4 inches diameter, each end of which is closed with a diaphragm pierced with an aperture of 5 mm. placed dead centrally with the prism, on each side of which are the sources of light to be compared; the standard being fixed while the light under test is moved to obtain the balance between the illuminations. The oscillating bar can be worked by any motor.

There were, however, the author said, difficulties in connection with this arrangement, and also in one invented by Whitman. It was not until 1902 that the difficulty of colour photometry was overcome, when Messrs. Simmance and Abady brought out a successful form of the scintillation method. This followed out the same idea as that of Rood—to display before the eye, for an equal space of time, the rays from the standard and the light under test alternately in quick rotation. A flickering sensation was produced, which continued until the lights were varied, or the disc-box moved, so that each source of light was casting an equal ray on the screen, when the flickering ceased. An unchanging and apparently motionless disc then appeared before the eye; and, presuming the two lights under test were of red and blue, the apparently motionless disc would appear to be of those colours perfectly blended. The disc, which revolved, was of pure white material, having a periphery of a peculiar shape.

The value of Mr. Grimwood's contribution was greatly enhanced by his having various models, &c., to explain the different points. Among these was a model of the Photosphene and a Flicker photometer, for being able to exhibit which he acknowledged his indebtedness to Mr. Abady. At the close of the paper, questions were addressed to the author by several of the members.

Mr. W. Upton inquired whether he was to understand that when comparing lights of quite different colour, one got an exact blend of the two colours on the revolving white disc. If so, did not this seem to call into account some quality of judging colour? Was there any difficulty in judging the exact tint, because, if so, it appeared to bring the personal equation into the machine. When they came to deal with colour work a good many of them would be poor ones at matching. Mr. S. A. Carpenter asked which system of testing Mr. Grimwood found most efficient—the bar photometer or the table photometer. The Secretary (Mr. P. F. Scarth) wished to know whether it mattered at what speed the disc revolved. Mr. W. E. Dean asked what was the standard light used for street testing; and Mr. H. J. Carpenter inquired whether colours could be tested on an ordinary Bunsen photometer.

In the course of a few remarks, the President said he did not think the author had honoured the Bunsen screen with all the good that might have been stated of it. It had been said that the Bunsen disc had been shown not to give a true reading when the colour of the standard differed from that of the light to be tested; but he (the President) did not altogether agree with this. He thought it was to a great extent a question of the individual's sensitiveness to tint of colour—whether he had been trained to judge tints of colour. It seemed to him that an element of uncertainty might arise in connection with the neutral point of the Flicker photometer, because the observer only saw the revolving disc with one eye. He would soon get tired of looking with one eye only, and would change over to the other. But as both eyes

would not be alike, he would then get another reading. This he did not believe had been thought of when not giving the instrument the means of viewing with two eyes. The speed also entered very largely into the determination; and therefore it should be stated that with certain colours one should use certain speeds.

Mr. Grimwood, in reply, said that several trials were made in which the Bunsen disc was used, and two lights of the same colour were tested; and the point was ascertained at which the spot disappeared. Then the Flicker was put on; and the disappearance of the flickering sensation was found to be at the very same point. Afterwards two Welsbach mantles were put under test first with the Bunsen disc and then with the Flicker; and once more the same reading was given in each case. Then two different lights were tested; and the reading with the Bunsen was found to be practically impossible. The Flicker was employed, and the point was found at which the flickering disappeared; and it was presumed to be logic to say that this was the point of equality. With regard to its being necessary to use the two eyes, he could not say anything at all to this. Then with reference to speeds. The Flicker should be used with as low a speed as would give a disappearance. Where the lights were very different in colour, it would be necessary to increase the speed to arrive at a point at which the flickering would disappear. The speed of the disc depended upon the variation of the colours under test. If there was a great difference in colour, the speed needed to be very high; whereas for two lights of the same colour, the speed was very, very slow indeed—in fact, it could be stopped altogether. The colour did not come into any consideration whatever. He should prefer reading on the bar photometer rather than the table one, using a Bunsen disc as an indicator. He found a pentane flame was about the best for testing street lights. A wick carburettor was used, to ensure keeping alight. Of course, there was a piece of glass between the disc and the light. With lights that only varied in colour slightly, comparisons could be made very readily with the Bunsen disc, by persons who had had experience; but experience was necessary.

A hearty vote of thanks was accorded to Mr. Grimwood for his paper; and before the meeting separated it was announced that Mr. Winslow had been elected a member of the Council in place of a retiring member.

YORKSHIRE JUNIOR GAS ASSOCIATION.

The Annual Meeting of the Association was held in the University Buildings, Leeds, on Saturday, and, as usual, consisted of a business meeting followed by a lecture. A goodly muster of members was in attendance at the hour for commencement. The retiring President, Mr. W. Cranfield, formally inducted his successor, Mr. E. J. Sutcliffe, the Superintendent of the Birkshall Gas-Works, Bradford, who then took charge of all the subsequent proceedings.

The Secretary (Mr. C. T. B. Roper) presented his report on the year's working, which was accepted by the meeting after congratulatory remarks from Messrs. Webb and Cawthra. The new session begins with 84 ordinary and 8 honorary members. The balance-sheet submitted by the Treasurer (Mr. H. D. Lumb) was also accepted as satisfactory.

Before proceeding to the election of officers, the President voiced the Association's pleasure at being honoured with the presence of Professor Smithells, F.R.S., and invited him to address the members. On rising, he was warmly greeted by the members, who had lively recollections of his lecture to them two years ago, and of many marks of interest subsequently. He said it would be churlish to refuse so kindly an invitation; and he rose to express his pleasure at being with them, and to say how warmly the University authorities welcomed them there. He was pleased to mark the continued success of the Association. He regularly received the reprints of their proceedings, and read them, though he regretted his inability to be often present; he congratulated them on the character of their meetings and on the papers read. They had proved the existence of a real need for their organization, which had served a useful purpose, and by their example had helped to inspire the establishment of similar Associations. He congratulated their new President on his accession to the chair, and wished him a happy and useful year of office.

Officers for the ensuing year were then elected as follows:—

President.—Mr. E. J. Sutcliffe, of Bradford.
Senior Vice-President.—Mr. G. W. Fligg, of Dewsbury.
Junior Vice-President.—Mr. J. H. Hill, of York.
Ex-President.—Mr. W. Cranfield, of Halifax.
Secretary.—Mr. C. T. B. Roper, of Bradford.
Treasurer.—Mr. H. D. Lumb, of Mirfield.
Members of Council.—Messrs. A. Edwards, of Leeds, W. Sanderson, of Mirfield, F. Scholefield, of Dewsbury, R. N. Webb, of Leeds, and E. Gillett, of Bradford.
Auditors.—Messrs. E. E. Stones, of Elland, and C. H. Turner, of Mirfield.

Votes of thanks were then accorded to the University authorities for placing the Library and Lecture Theatre at the disposal of the Association, and to the officers for their services during the past year. In replying to the latter vote, the ex-President said that even as the proverb assured us that a country that had no history was happy, so was an association whose work went as smoothly as theirs, and with as little calling for special comment. The Council and officers had worked harmoniously, and with a whole-hearted devotion to the interests of those they represented; and on behalf of them all, he thanked the members for their confidence, and for the kindly words spoken by the proposer (Mr. Nuttall) and seconder (Mr. Smith) of the motion. Personally, he wished to take the opportunity of bearing testimony to the unremitting zeal and high efficiency of the two Secretaries with whom he had been associated—Mr. Scholefield and Mr. Roper—to whom he tendered his personal thanks. He was happy that the Association had so successfully passed that most critical time in their history—the second year. For the first year they had the stimulus of their brilliant initial send-off. Later on would come the impulse of much steady successful work; but the intervening period was what most severely tried a new organization. On their behalf, he would congratulate the newly-formed Midland Counties Junior Gas Association on their good start and bright prospects. They in the North had been awaiting this development, and they now turned expectantly to the young men of the Tyneside district for them to follow suit and so practically complete the roll of the Junior Gas Associations. He was glad to have been able to obtain for them three such lectures as they had had at their annual meetings; and although he had not been successful in accomplishing everything he had hoped and tried to do in other ways—as, for example, in the direction of such further educational facilities as he had outlined in his Presidential Address last year—yet he had really endeavoured to work hard in their interests. As individuals and as associations, he thought that the prospects of the Juniors were hopeful and bright, and that developments of no small value would arise in the future. Youth had the unrest of ambition and enthusiasm as one of its privileges; and he begged all their Associations not to be too tamely satisfied with the present conditions. The gas industry, being one of comparatively modern growth, had not one of the influential and wealthy Guilds of the City of London associated with it; but, considering the enormous capital that it now represented, it was certainly far from holding its proper place in the educational facilities accorded to its students—contrasting most unfavourably with the lavish equipment (both for research and instruction) possessed by the great rival of gas, electricity. It behoved them not to be too impassive and quiescent, but to "ask—ask—ask," especially when they saw the danger of the division of the funds of these rich Guilds, which were intended originally largely for the technical and general education of the young and the sustenance of the aged members of a trade. The institution within whose walls the members were then met owed much to the liberality of some of these same Guilds; but he thought it very significant that a highly-placed personage, in close touch with Royalty, recently claimed that the funds of these Guilds should be largely employed in promoting emigration of our young men and women to Canada, and that, so far as he knew, no protest was then or had subsequently been made. He had no misgivings as to the future of their Association; and he was glad that Mr. Sutcliffe succeeded to the presidency under bright conditions. He congratulated him on the Association of which he was now the head, and in turn congratulated the members on their new President.

Dr. G. R. Thompson, Professor of Mining at the University, then gave a lecture on "The Utilization of Fuel," a report of which will be found on p. 301.

The President, in alluding to the lecturer's reference to adapting coke for household use, stated that in Bradford they had set themselves to cater for this class of custom; and, by breaking coke up to a suitable size, and promoting its sale in small quantities to householders, they had in three years built up a sale in this way of from 400 to 500 tons weekly.

Mr. J. H. Brearley (Longwood), the President of the Manchester District Institution, proposed a vote of thanks to the lecturer, and said he could quite confirm Mr. Sutcliffe's experience in the possibility of fostering a steady outlet for their coke by catering for the needs of domestic users. He would point out to the lecturer, in connection with his references to Royston as an example of the supply of enriched coke-oven gas for illuminating purposes, that after all it had been of such small success there, owing to the wide variations in the illuminating power of the gas, that ordinary coal gas had to be made instead, though he was uncertain whether or not they managed to mix some of the coke-oven gas with the coal gas. He was glad to hear Professor Thompson's references to distribution, and the advances that might be made in this direction. He was certain that it was a question of supreme importance as to how far we might go in the distribution of gas in bulk. Simply viewed as a matter of economy, we might go far in the matter of consolidating groups of small works; making gas at one central works and perhaps utilizing some of the existing small ones as distributing stations. His own works at Longwood were not very large, and yet they supplied an area that was formerly served by five works. Against the advantages of thus manufacturing gas for large areas at one central works would have to be put the enhanced cost of distributing the coke; and this might be a serious difficulty. Any proposals to make sweeping changes in existing conditions, in order to secure economy in fuel utilization, must be accompanied by strict legal care and equitable adjustment of existing gas interests, and especially stringent regulations, strictly enforced, in connection with the wasteful use of fuel indicated

by the smoke nuisance. He agreed that a half-way coke, such as Professor Thompson referred to, would lead to a crucial change in domestic sales. We had now secured a gradually increasing demand; but then it would advance by leaps and bounds.

Mr. J. E. DUDLEY (Oldham), the President of the Manchester and District Junior Gas Association, seconded the vote. He congratulated the members on hearing so interesting and instructive a lecture, and one that, as had been previously pointed out, needed, and would repay, pondering over. He had always felt compelled to admit that Oldham was smoky; but the lantern illustrations of Leeds scenes would make him look with kindlier eyes upon his own town.

Mr. CRANFIELD, in supporting the motion, expressed his personal thanks to Professor Thompson for his kindly promptness in acceding to his request for the lecture, which had amply realized their hopes, and worthily sustained the traditions of the annual meetings. He rejoiced much that they had had with them that afternoon a seer—one who was able to detach himself from present circumstances and prejudices, and look at matters widely and from new standpoints, and thus see new possibilities. The lecturer had certainly realized Matthew Arnold's conception of "making a healthy stream of fresh ideas play round our stock notions;" and he hoped the process would be invigorating and fruitful. As showing the lecturer how far the Association was on right lines in catering for the members, he might say that the Tingley coke-oven arrangements, which had been dealt with at length in the lecture, had already been visited by the members, and a visit had been arranged to see the Royston experiment, but had been deferred at the request of the authorities there.

Professor THOMPSON, in acknowledging the vote, said he had been guarded in his references to Royston, knowing of the uncertainty as to the success of the arrangements carried out there; but in at least one Yorkshire village coke-oven gas was now being delivered to houses—though he was unacquainted with the full details. He had come before them as representing the first producer, while they represented the final distributors; and if his remarks had stimulated any interest, it was largely because he thus came to them as an outsider, and as one who approached the subject from the point of view of a coke maker wishful of utilizing the great stores of small coal which existed at the pits. He was a coke designer while they were gas designers; and he had given expression to his hope that the two classes might in future be able to join hands and co-operate in producing various types of combustible suitable for different purposes, and so secure economy in the utilization of fuel and fresh uses for it. He was sure the gas industry would profit even more than the mining industry from such co-operation and demarcation of spheres of industry. Mr. Crossley had stated that coal with 25 per cent. of ash could be used in producers, and even with 50 per cent. if suitable apparatus was employed. Such stuff abounded at most of the pits, and was at present much of a nuisance, occasionally catching fire; so that utilization of such material—waste at present—would really be as welcome a prospect to the miner as to the economist.

Junior Institution of Engineers.—The opening meeting of the session 1905-6 will be held at the Westminster Palace Hotel on Friday, when Mr. Dugald Clerk, M.Inst.C.E., will deliver his Inaugural Address, the subject of which will be "The Problem of the Gas-Turbine."

Manchester District Institution of Gas Engineers.—We learn from the Hon. Secretary (Mr. H. Kendrick) that the next meeting of the Manchester District Institution of Gas Engineers will be held at Stockport, on Saturday, Nov. 25. The members will visit the Portwood Gas-Works, discuss the President's Address and the Question-Box answers, and Mr. Thomas Newbigging and Mr. Kendrick will read short papers.

Serious Accident to Mr. John Phillips.—The Secretary of the Bristol Gas Company, met with an accident a few days ago. When alighting from a tramcar near the Company's premises, he slipped and fell heavily to the ground. He was promptly taken to his office, when it was found that he was suffering from a fractured collar-bone. He was subsequently removed to his residence, where we are glad to find he has been making satisfactory progress towards recovery. Mr. Irving reported yesterday afternoon that the invalid is "progressing very favourably."

Possibilities of Heat-Engines.—Professor F. W. Burstall recently delivered his Presidential Address to the members of the University Engineering Society of Birmingham; its subject being "The Possibilities of the Heat-Engine, together with Some Remarks on the Gas-Turbine." He pointed out that, owing to the advanced stage which the science of thermodynamics has reached, we can easily predict the lines on which the heat-engine of the future will be developed. He considers that the steam-engine has reached its maximum efficiency, and that much more development in this form of engine cannot be expected, owing to its great loss of economy. He looks in the future for the utilization of the sun's heat direct for heat-engines. Discussing the prospects of the gas-engine, Professor Burstall said that the future ideal production would be an engine with a very high compression, thorough scavenging action, and of the four-stroke cycle. Of the oil-engines at present in use, that working on the Diesel principle was the best type, and was likely to have the greatest future. He considered that the outlook for the success of gas-turbines was remote, the practical difficulties in their way being so great.

SCOTTISH JUNIOR GAS ASSOCIATION.

Western District.

VISIT TO THE FALKIRK CORPORATION NEW GAS-WORKS.

Last Saturday afternoon, the members of the Scottish Junior Gas Association (Western District), to the number of about fifty, paid a visit to the new gas-works, which are nearing completion, of the Falkirk Corporation. Mr. J. BELL, of Airdrie, the President, headed the party, and with him was Mr. G. Braidwood, of Dawsholm, the Hon. Secretary.

Provost CHRISTIE, of Falkirk, who, along with Mr. H. Rule, the Assistant-Manager, received the members, said he had great pleasure in welcoming them. He was sorry Mr. M'Crae, the Engineer and Manager, was suffering from a bad cold, otherwise he would have been present; but Mr. Rule would be able to take his place. He hoped they would find it an interesting visit. They would be better able to judge of the works by seeing them than by anything he could say; but he was hopeful that when they inspected them, they would be able to pronounce them thoroughly up-to-date in every way. At any rate, the Corporation were thoroughly satisfied with them; and they thought they reflected the greatest credit on the Engineer. The Corporation felt that an honour had been conferred upon them in that the Association had thought it worth their while to come to Falkirk to see their works.

Small parties were formed, under the leadership of Mr. Rule, Mr. W. Pitcairn (the works foreman), Mr. P. Corner (the clerk of works), and Mr. P. Blair (the draughtsman), and the works were inspected and explained by the guides. Unfortunately, rain fell heavily the whole time, which detracted from the pleasure, though not from the interest, of the visit. The works were found to be so far advanced, though it is little more than a year since their erection began, that it will be possible to make gas in them in about three weeks' time. The retort-bench has been under heat since June, and is now in fit condition for work. All the connecting-pipes have been laid, as well as the main to the town; indeed, almost the only work still to be overtaken is the completion of the coal and coke conveyors, both of which, however, are well advanced.

After the inspection, the visitors were entertained to tea in a restaurant in the town—Mr. Rule presiding.

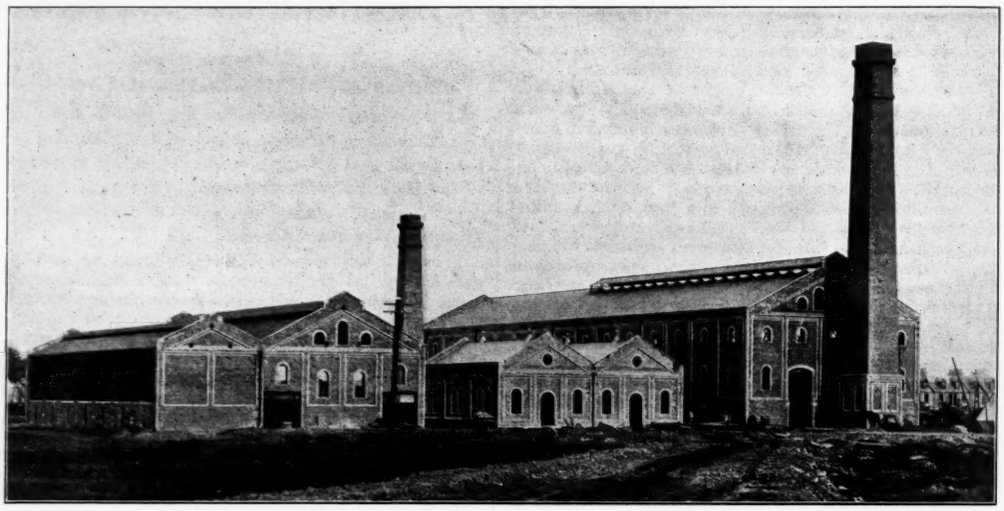
The CHAIRMAN said he was sorry the Association had not waited a month longer before paying their visit, because they would then have witnessed the works in operation; but they had seen them in course of erection, and possibly this would appeal to most of them. He was sorry Mr. M'Crae did not feel well enough to meet the members; and he (Mr. Rule) had to convey to them his apology for absence, and to express the hope that they had enjoyed their visit.

The PRESIDENT (Mr. Bell) said they were indeed very grateful to the Corporation of Falkirk, and also to Mr. M'Crae and his assistants, for the splendid manner in which they had been treated. They were all sorry at Mr. M'Crae's inability to be with them, because it would, he was sure, have been a great pleasure to him to accompany the members round the new works. Much credit, he thought, was due to him for the splendid works he had managed to bring nearly to completion. He (the President) thought they ought to show their appreciation of the kindness which had been shown them by returning their hearty thanks to Mr. M'Crae, as well as to the Gas Committee, for allowing them to visit the works.

This was cordially agreed to, and the proceedings terminated.

DESCRIPTION OF THE WORKS.

The new works, which, as already mentioned, have been designed by Mr. W. M'Crae, the Engineer and Manager, and erected to plans prepared by him, are situated at Thornhill, to the south-east of the town, and about a mile from the railway station at Grahamston, which is really the station for Falkirk. They stand in a field 12 acres in extent, bounded on the north by the Forth and Clyde Canal, and are approached from the town by a private road. Later on a railway siding will be formed, running the greater part of the distance (nearly half-a-mile) parallel with the road, and then, curving round, will cross the road on the level, and enter the works. Those erected are a first section, and are capable of producing about 1½ million cubic feet of gas per day. They consist of two main buildings, running north and south, standing some distance apart—one the retort-house and coal-store, end-on, and the other the purifier-house, with a third, and smaller, building between them, containing in one section the exhausters and station meter. In the immediate rear of this building are the boilers, and beyond them the condensers, the tar-well, and the scrubbers. The design is as simple as possible. The gas passes southward in the hydraulic main, then along the interior of the southern gable of the retort-house, northward along the whole of the western wall of the retort-house and coal-store, dipping in its course, and then descends into the ground, goes out to the yard, through the condensers southwards again to the exhausters, northwards the same distance to the scrubbers, southwards again through the purifier-house, eastwards to the station meter, and thence to the holder, in the south-east corner of the



THE FALKIRK CORPORATION NEW GAS-WORKS.

ground. The governor is an underground atmospherically controlled one, near where the gas leaves the works. A complete system of bye-passing has been introduced, including Laidlaw's compensator, which works automatically at the exhausters.

The retort-house is 153 feet long and 70 feet wide. The height from the ground-level to the wall-plate is 41 feet. The slate roof is tied upon iron strip. With the exception of the eastern wall, the house is of brick—five courses stretchers and one headers, which is the style of building adopted throughout the works. The eastern wall is of corrugated iron, which can be easily removed when it becomes necessary to extend the retort-house by building another alongside. A chimney, 130 feet high and 6 ft. 6 in. square inside, has been erected at the south end.

The retort-bench, with the fittings, has been erected by Messrs. R. Dempster and Sons, Limited, of Elland. It is designed for twelve ovens of through retorts; but at present only nine beds are set. The eighth bed is on Waddell's patent regenerative principle. The retorts are 20 feet throughs, Ω-shaped, 22 in. by 16 in., with self-sealing lids. The firing throughout is regenerative. The ascension-pipes are 7 inches internal diameter. There is a separate hydraulic main and tar take-off for every three beds. The tar and liquor overflows into a tar-tower at the north end of the bench, where the seal in the hydraulic main is regulated by a weir-valve. This maintains an even seal of liquor only. Each through bed of retorts has its own producer. A shoot conveys the hot coke from the centre retorts to the producers, which are fitted with V-bars, and also false bars to facilitate clinking. The stoking machinery, by Messrs. Dempster and Sons, consist of a charging and discharging machine; and they are the first erected under the patent. They are capable of dealing with 96 through retorts every three hours. The charging-machine will carry a hopper containing 5 tons of coal, which is sufficient for about 16 retorts.*

The coke-handling plant is by West's Gas Improvement Company, Limited, of Manchester. The hot-coke conveyor runs the whole length of the retort-bench, and is fitted with quenching apparatus. The coke is conveyed to hoppers outside, and runs over a screen, with bars ¾ inch apart, before being deposited in the hoppers. Two large hoppers will each contain 25 tons of coke, and a smaller hopper 10 tons of breeze.

The coal-store is the north portion of the retort-house, and is 100 feet long by 70 feet wide; its capacity being about 3000 tons. The coal-handling plant is being erected by Messrs. Dickson and Mann, of Armadale. The coal will be tipped from the waggons by a hydraulic ram into the coal-breaker, which is intended to deal with 25 tons per hour; or it may be bye-passed so as to be stored at the largest size. From the breaker it is elevated to an overhead scraper conveyor. Five adjustable shoots are placed at intervals in the conveyor, so that the coal may be deposited at whatever position may be desired; or it may be taken by means of cross-conveyors to overhead hoppers from which the charging-machines are served. The overhead hoppers hold 10 tons each. Should the coal have to be taken out of the store, there is a second breaker and elevator within the store for dealing with it.

As to this point, all the power required will be obtained from electric motors, driven by current derived from the Corporation power station.

The steam-boilers are by Messrs. Babcock and Wilcox, of Glasgow. They have each a heating surface of 593 square feet and can evaporate 2000 lbs. of water per hour. The chimney is 80 feet high, and 4 feet square inside.

The condensers are of the water-tube type, for which water will be pumped from the canal. They have been erected by Messrs. Ashmore, Benson, Pease, and Co., of Stockton.

The exhauster and meter house, 66 feet by 20 feet, and 20 feet high, is lighted by two Lucas lamps, each of 400-candle power. The exhausters have been erected by Messrs. R. Laidlaw and Son, of Glasgow. They are of the three-blade type. There are two sets, each driven by a steam-engine; provision being made for the coupling on of an additional exhauster when required. The steam-engines are of the non-condensing type. At present each set of exhausters is capable of passing 80,000 cubic feet of gas per hour. The station meter, of the same capacity, has been erected by Messrs. R. Laidlaw and Son, of Edinburgh.

The tar-extractor is of the Livesey type, and has been erected by Messrs. W. C. Holmes and Co., of Huddersfield. It is placed immediately in front of the scrubber-washer, which has also been erected by the firm. Only part of the scrubbing plant has been put up, as it is intended to use but partially the new works during the winter; and next summer, when the old works will be closed, the scrubber-washer there will be transferred to the new site. The underground tar-tank is built of expanded metal and concrete. It is 40 feet by 20 feet, and 15 ft. 6 in. deep, and will hold about 80,000 gallons.

The purifiers have been erected by Messrs. R. Dempster and Sons, Limited. They are four in number, and are of the luteless type, the joints being of india-rubber, tightened up with patent fastenings. Three tiers of ordinary grids are fitted, and one of Weck's valves is used. It is the intention at present to purify with lime.

The gasholder on the works is one which has been brought from another site, and reconstructed by Messrs. Clayton, Son, and Co., Limited, of Leeds. It was originally a two-lift holder with steel tank, and worked on the wire-rope guided principle. It has now been converted into a three-lift holder, column-guided; its capacity being increased from 500,000 to 750,000 cubic feet.

Throughout the works the main pipes are 18 inches in diameter, and the trunk main from the gasholder is 24 inches.

* This machinery has been described and illustrated in the "JOURNAL" (see *ante*, p. 114).

The Milan International Exhibition.—In a previous issue of the "JOURNAL" reference was made to this exhibition, which will be opened on the 15th of April next. It will be on a large scale, and the success of its international character has already been assured by the participation of France, Germany, Austria, the United States, and other leading countries. The contents of the exhibition will be divided into ten sections, nine of which will be international and one national. A British Commission has been formed, of which Mr. Arthur Serena is the Honorary Executive Commissioner; and a grant of £10,000 has been made by the Government for the creation of a British Section. The British Chamber of Commerce for Italy, of which Mr. Evan Mackenzie is Chairman, are anxious to assist Mr. Serena in his arduous task, and in a circular they have issued they invite British manufacturers to take part in the exhibition. They point out that British goods of the best quality are preferred in Italy to any others; and they think the opportunity afforded by the exhibition of comparing them with the manufactures (and sometimes imitations) of other countries, should not be lost. In their opinion, the result should not be unfavourable to British industry. Among the articles with which this industry is largely concerned are those connected with lighting and heating; and the Chamber consider that British manufacturers should be able to successfully compete in the supply of the Italian demand for them. They lay stress upon the fact that Italy is now entering upon a period of great prosperity, and that her purchasing power has vastly increased. They, therefore, think that her markets, which are open to goods of the highest quality and machinery of the latest type, should not be neglected. His Majesty the King of Italy will offer prizes to the amount of £1600; one of £400 being for the best and most original exhibit of machinery or manufacturing process.

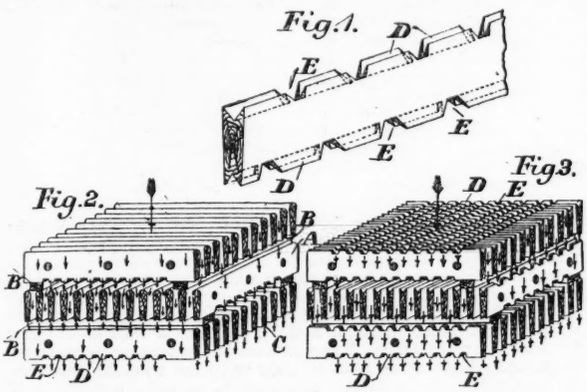
REGISTER OF PATENTS.

Gratings for Gas-Scrubbers, &c.—Zschocke, G., of Kaiserlautern, Germany. No. 20,944; Sept. 29, 1904. Date claimed under International Convention, Oct. 19, 1903.

This invention has for its object a wooden grating for water-coolers, gas-scrubbers, and the like, constructed as shown. A bar of the grating is represented in fig. 1; while figs. 2 and 3 show several layers of grating, with two different constructional forms of bar.

The grating bar consists of a single piece of wood provided above and below with a channel, by which means "the absorption surface is largely increased, and the number of teeth D, and consequently that of the drops falling also, is doubled." Above and below, slots are formed to permit the liquid to flow down laterally.

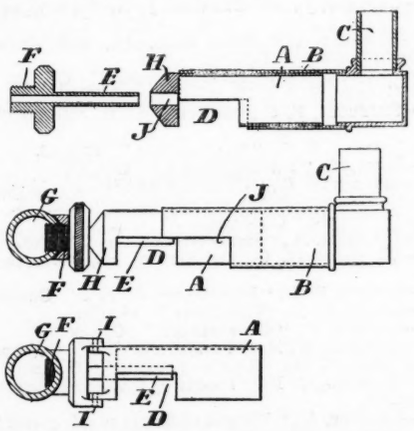
Fig. 3 shows a number of wooden gratings composed of bars of this kind and placed one above the other. Each set of wooden bars is separated by an intermediate piece B. The upper channels distribute the liquid in the manner of troughs over the entire length of the grating, and permit it to flow laterally through the slots E on the surface of the bar. The liquid flowing down both sides of the bar is kept separate by the lower channel and broken up into a very large number of small drops, which, in turn, fall on to the next grating. In fig. 2, a similar arrangement of superposed gratings is shown, in which, however, the separate bars are only provided with a lower channel, and are, accordingly, only provided with slots E on their lower part.



The patentee remarks that, in ammonia and benzol scrubbers and the like, the arrangement described distributes a small quantity of liquid very slowly over a large grating surface, and constantly presents fresh attacking surfaces to the gases flowing through. The gas itself is split up and divided by the large number of teeth and cutting surfaces, and so is obliged to come into contact with all the faces of the grating. The grating also effects an "entirely new action." The water, oil, or other liquid trickling down does not, as hitherto, flow uninterruptedly from the upper to the lower course of grating, but is in the first place retained by the upper channels and distributed throughout the surface of the grating and the length of the rails, and, being kept divided on the under ends of the rails by the channel, is caused to drip therefrom. Therefore, "owing to the increased absorption surface, the peculiar distribution, and the trickling over these surfaces, and also owing to the breaking up of the liquid into double the number of small drops, a two or even a three fold effect is obtained as compared with any appliance hitherto employed for such a purpose."

Atmospheric Gas-Burners.—Tilley, F. C., of Kingsland Road, E. No. 23,810; Nov. 3, 1904.

These burners for use in gas-fires are so constructed that the burner proper or outlet can "be placed in any desired position to suit the shape of the stove or to get the desired effect."



The illustrations show a side sectional elevation of the burner with the gas spit or nozzle detached; a side elevation of the burner in the extended condition; and a side elevation of one tube of the atmospheric burner and the gas spit or nozzle—the tube being hinged to the gas spit or nozzle base or carrier.

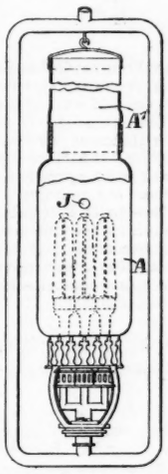
The burner is made of two or more tubes A B arranged to telescope one within the other; the burner nipple C being at one end of the tube B, and the air-inlet D at the end. The spit or nozzle E is fitted in the air-inlet tube, and is provided with a screwed base F for connection to a gas supply-pipe G—the spit or nozzle being capable of being bendable to suit the position of the atmospheric burner.

The tube A is provided at one end with a wall H, which may have its outer surface coned and provided with a hole J, which passes over the gas-spit E. When the burner tubes are to be placed at an angle to the gas supply-pipe G, the tubes A B are forced sideways to the desired position, and in so doing will bend the gas-spit E near its base F, but in such a manner that the portion of the gas-nozzle E within the tube A will remain central.

Any number of these burners may be secured to the supply-pipe or main float G; and the burner-pipes can be adjusted as to the position of the burner-nozzles—that is to say, the main float G may be straight and the burner-nozzles arranged in the segment of a circle to suit the front of an ordinary coal-stove filled with asbestos fuel.

High-Power Self-Intensified Lights for Incandescent Gas Lighting.—Bray, J. W., of Leeds. No. 26,197; Dec. 2, 1904.

The inventor proposes to combine two or more bunsen flames and gas-mantles, in such a manner that the heat and light from one mantle and flame intensifies the heat and light from its neighbouring mantle and flame, without such heating and lighting effect being obstructed by any central suspending tube or other heat and light obstructing body.



The chimney A is made to encircle the mantles and flames in the cluster as distinct from a chimney for each mantle and flame, and also as distinct from a globe used as a wind guard, or for decoration, or distribution of light. This latter does not produce a suitable upward current of air for the purpose of intensifying the flame, which is the purpose effected by the chimney shown. It is made in two or more parts A and A^1; and these parts may be constructed of different material, forming one substantially continuous chimney. The cluster of burners is so constructed as to readily fit on, or be lifted from, the gas supply-pipe by means of a "lift off" joint as distinct from a screw—such joint consisting of a nipple or the like fitting into a socket. There may be sufficient play between the portions A and A^1 of the chimney in order to allow of the movement necessary for this operation, or the upper part of the chimney may be held by a hook (in order that it may be pushed up when desired) suspended from the gas supply-pipe. This arrangement is made with a view to the easy removal of the cluster from the gas supply-pipe for the renewal of mantles or for repairs.

Many forms of incandescent gas-burners—and, in particular, the class with which this specification deals—are (says the patentee) apt to prove noisy in use, giving rise to sounds of a hissing, roaring, or singing character. The liability of such sounds is greatly reduced by having one or more holes J in the chimney A, at a level above the top of the mantles. Holes in the chimney have been heretofore used at a lower level for the purpose of supplying additional air to the flame; but it is said that with these improved burners, such holes at a lower level would be a disadvantage, and have the effect of reducing instead of increasing the efficiency of the burner. The apertures J are also convenient for relighting the flames in the event of the pilot-light going out.

Generators for Gas-Motors.—Barriere, P., of Paris. No. 566; Jan. 11, 1905. Date claimed under International Convention, Jan. 13, 1904.

In all gas-generators directly supplying a gas-motor, the most important point, says the patentee, is the regulation of the proportion of steam and air sucked into the generator. This mixture of steam and air should present variable proportions according as the motor develops more or less power; the quantity of steam admitted attaining its maximum when the motor runs with a full load, and diminishing progressively in proportion as the motor develops less power—the steam being entirely excluded when the motor is running idle.

The apparatus (p. 318) comprises a cast-iron cylinder A, in which is displaced a piston B, to which a constant tendency to return to the position represented is imparted by the lever C and a spring D (or a counterweight). By the intermediary of the connecting rod E, the extremity of the lever controls the steam-cock F. The pipe G conducts steam at a constant pressure from the vaporizer to the cock F; and the conduit H, from the cock to the furnace.

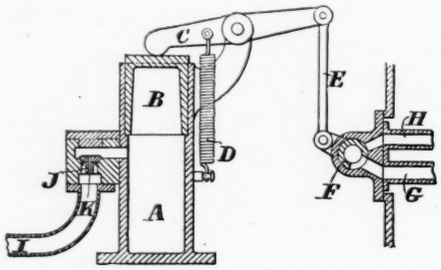
In the position represented (which is that occupied by the apparatus when in repose), there is no communication between the pipes G and H, and no steam is admitted into the generator.

The cylinder A communicates with the exhaust reservoir of the motor through the pipe I, and is cut off by the valve J—of any suitable construction, and provided with a small passage K, leaving constant communication between the cylinder A and the pipe I.

The operation is as follows: The motor having been started, after each explosion in the motor cylinder there is a discharge of burnt gases, which momentarily produces a certain pressure in the exhaust box and consequently in the pipe I. Under the influence of this pressure, the valve J rises, and a certain quantity of gas enters the cylinder and lifts the piston by a certain amount. The pressure in the exhaust-box then becoming *nil*, the valve J closes, and the gases in the cylinder partially escape or return into the exhaust-box through the

passage K. They may, however, be allowed to escape into the atmosphere.

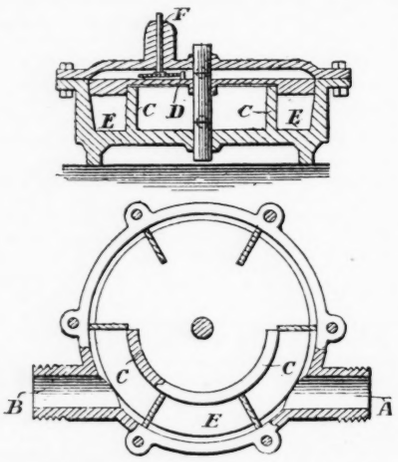
Assuming that two-thirds of the volume introduced while the valve J is lifted returns to the exhaust-box or escapes into the atmosphere, when the motor gives an explosion at each revolution—that is to say, when it is developing its full power—the cylinder retains between these consecutive explosions one-third of the volume of the gases introduced into it at each exhaust of the burnt gases. Consequently, the pressure will increase in the cylinder; and the piston B will rise more and more, and therefore open to an increasing extent the steam-regulating cock F, until the pressure in the cylinder is equal to the maximum pressure produced in the exhaust-box. The piston then remains practically stationary, in a position corresponding to the maximum opening of the cock F, and consequently to the maximum admission of steam.



If the motor is running without load, it gives (say) one explosion in four only. The gases contained in the cylinder flow through the passage K, since during the period of the three omitted explosions twice the volume introduced during an explosion flows through. The piston B will thus speedily return to the position indicated, and no more steam will be introduced, because the explosions separated by such an interval only serve to displace the cock so as to bring angle to angle the steam communication orifices. If the motor is running with loads intermediate between its maximum load and no load, it is obvious that, by the more or less frequent omission of explosions, the pressure of the gases in the cylinder will become greater or less, and the position of the piston will vary between the position represented and its uppermost position—giving an aperture of the cock F intermediate between the maximum admission and complete cutting off of the steam.

Water-Meters.—M'Creary, E. H., and Nieman, G. A., of Beaverfalls, U.S.A. No. 7402; April 7, 1905. Date claimed under International Convention, April 13, 1904.

To construct a water-meter in accordance with this invention, an annular casing is fitted with a lid or cover secured by means of bolts, and the casing formed with a water-inlet A and an outlet B. Formed integral with the casing (in the bottom of it) is a semi-circular partition C, arranged at a short distance from the inner wall of the casing and located opposite the inlet and outlet openings. Arranged in ball-bearings, in a vertical position at the centre of the casing, is a shaft carrying a horizontal disc D, having an enlarged periphery to form bearing-sockets for a series of hinged wings arranged radially and at equal distances from each other. These wings consist of a cylindrical portion adapted to fit neatly in corresponding recesses formed in the enlarged periphery of the disc D, and an outwardly-projecting blade of a size and shape similar to that of a cross-section taken through the chamber E.



Mounted in a suitable bearing formed integral with the cover of the meter is a shaft F having attached to its inner end a toothed wheel which, when brought in contact with a pin secured to the face of the rotatable disc D, will cause the toothed wheel to revolve a limited distance. This shaft operates the registering mechanism usual in various styles of water-meters now in use.

In operation, the water entering the inlet-pipe under pressure will strike the wing directly opposite, propelling it in the direction of the outlet, and thereby causing the disc D to turn and at each complete revolution operate the shaft F, connected to the indicating-dials of the meter. This movement is accomplished by the peculiar manner in which the wings are hinged, which, when operated upon by the force of the water, will be held in a vertical position.

Valves for Gas-Producers.—Moore, W. H., and Livens, F. H., of Lincoln. No. 12,059; June 9, 1905.

This cock, to be used with gas-producers of either the suction or pressure type (for diverting the gas either to the scrubber or to the atmosphere), is made with a cylindrical or taper plug, a loose washer, and a loose handle, and fits in a casting having suitable ports opening to three branches. As shown, the plug is made with a channel of such shape that, by its means, a connection can be brought about between two of the three ports; the third port being at the time covered by the plug. The cock can be worked from either side; in the first by turning the plug end-to-end in the seat, and in the second by simply moving the handle on to the opposite washer—the plug remaining in its place.

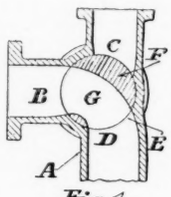


Fig. 1.

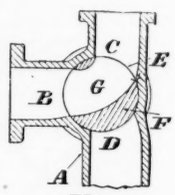


Fig. 2.

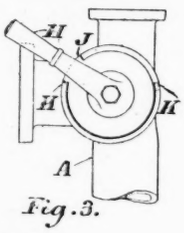


Fig. 3.

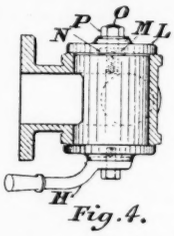


Fig. 4.

The seating A contains the ports B, C, and D; while E is the passage in which the plug F turns. B is the port open to the generator, C to the blow-off pipe and to the atmosphere, while D leads to the scrubber. As shown in fig. 1, the ports B and D are connected to each other by the channel G formed in the plug F; the port C being closed. But by turning the plug on its axis, the channel G can be made to connect the ports B and C; the port D then being closed by the plug as in fig. 2. The gas from the generator therefore can be passed either to the blow-off pipe or to the scrubber, according to the position of the plug. The plug is moved by a handle H, as shown in fig. 4.

To prevent the plug being moved too far in either direction, it is provided with a stop J (fig. 3), which engages with projections K formed on the seating. These projections are made on both sides of the seating when the plug is arranged to be turned end-for-end. The plug is retained in the passage E by a washer L, having a square hole M, into which fits a corresponding square boss N formed on the end of the plug F—the washer and plug being held together by a stud O and nut P.

APPLICATIONS FOR LETTERS PATENT.

12,954A.—Smith, W. B., "Incandescent burners." Oct. 20.
20,900.—The New Hygienic Stove Company, Ltd., and Greenwood, E. P., "Combined gas-jet and stop-tap." Oct. 16.
20,908.—Dempster, R., "Gasholders." Oct. 16.
20,958.—Illmer, L., jun., and Kunze, E. J., "Internal combustion engines." Oct. 16.
20,963.—Illmer, L., jun., and Kunze, E. J., "Gas-engine plants." Oct. 16.
20,964.—Illmer, L., jun., and Kunze, E. J., "Internal combustion engines." Oct. 16.
20,966.—Bishop, R. C., "Gas-heated boilers." Oct. 16.
20,969.—Sutherland, A. G., "Gas-meters." Oct. 16.
20,983.—Clark, W. E., "Incandescent burners." Oct. 16.
21,008.—Cleland, J., and Stewart, J. C., "Acetylene holders." Oct. 17.
21,053.—Duffield and Sons, Ltd., M., and Worsfold, J., "Atmospheric burners." Oct. 17.
21,096.—Russell, J. B., "Inverted burners." Oct. 17.
21,100.—Glover, S. & R. B., "Gas-engines." Oct. 18.
21,124.—Shadbolt, R. G., and Tully, C. B., "Gas manufacture." Oct. 18.
21,134.—Johnson, G. E., "Gas-pendants." Oct. 18.
21,166.—Moss, H., "Inverted burner." Oct. 18.
21,184.—Ainsworth, F., "Obviating the objectionable sound which occurs during the use of certain gas appliances." Oct. 18.
21,263.—Lentz, H., "Gas-turbines." Oct. 19.
21,287.—Lehmann, E., "Incandescent burners." Oct. 19.
21,303.—Worrall, H. O., and Dewey, H., "Bunsen burners." Oct. 20.
21,314.—Coates, J. G., "Incandescent fittings." Oct. 20.
21,317.—Guest, A. A., "Gas-globes." Oct. 20.
21,333.—Roemer, F., "Gas-producer." Oct. 20.
21,338.—Comings, W. R., "Packing mantles." Oct. 20.
21,358.—Tully, C. B., "Repairing retorts." Oct. 20.
21,369.—Harding, C. K., "Producing a combustible gaseous mixture." Oct. 20.
21,380.—Bieneck, A., "Water-trap for gas supply-pipes." Oct. 20.
21,405.—Bowmer, J. J., "Gas-producers." Oct. 21.
21,447.—Woodall, H. W., and Duckham, A. M'D., "Vertical retorts." Oct. 21.
21,459.—Kramer, E., "Incandescent burners." Oct. 21.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by Correspondents.]

Inverted Gas-Burners.

SIR,—The "Editorial Notes" on this subject in the last number of the "JOURNAL" have attracted my attention. This mode of gas lighting certainly deserves thought. It is to-day with us, and a large amount of capital is invested in it. Why is it popular—for the time being, at any rate—in this country, while in Germany and other Continental states it does not "take on"? The countries which have had the longer experience of incandescent gas lighting do not open their arms to receive it. If I may venture an opinion, I think the "upside down" arrangement of the flame closes their hearts against it; and if not their hearts, certainly their brains. It is just straining one's reasoning feats beyond the ordinary to admit that a flame which doubles upon itself is a sound contrivance for obtaining a better light. It is the well-recognized aim for a radiant light (not a concentrated one) that finds no realization in the inverted light, which I am strongly inclined to think is the cause of its rejection abroad. This circumstance should operate in this country with equal force and result. Why does it not? Because it resembles in appearance the electric light. The average man and his wife look upon that light as being the most perfect because it is the latest, and because the rich adopt it. I remember thinking so too, years ago, when the electric light first entered upon a public career. To-day we know that it is the incandescent gas-light which is the most perfect, for a great number of reasons, and not the electric light. One of the reasons is the low price; and another, and a very important one, the splendid radiancy of the light.

The very fault of the electric light, and consequently its unsuitableness for grateful illumination, is found in the inverted gas-light. Instead of a step in a forward direction, it is one backwards. We want a radiant, generous light for our needs, and not a concentrated one. The inverted gas-light is a concentrated light, and, therefore, of a whiteness that hurts the eye; and it has also but a narrow zone of light. The sun's light is our guide. We must endeavour to produce our artificial light as nearly like it as possible. It is the sun's radiance and its far-reaching light—going into every corner and crevice—which makes existence joyful. Who experiences this joyful sense in the moon's cold rays, which produce black, sharp shadows on the landscape? This same contrast between the sun's and the moon's light is repeated where the upright burner stands for the sun and the inverted burner for the moon.

If the public understood incandescent gas lighting better than they do, the probability lies very near that the inverted burner would not have found such ready acceptance. The moment was favourable for the inverted light; for it made its appearance just when the public commenced to pay some attention to the incandescent gas-light, and to grasp its value. The public as yet cannot distinguish between the difference of light of different burners; and accepting, after all, the electric light as the standard, they naturally take to the one which, in appearance, most resembles the electric. Frequently one hears the exclamation, "Like the electric," when they see an inverted gas-light. Perhaps the passion to imitate those above us in wordly possessions, and to be "in the swim" for what is the fashion, guides many in their choice as well. The choice is a bad one, not only because they deprive themselves of a radiant, cheerful, generous light, that fills every corner of their room, but also because the unnatural position and the unnatural direction of burning of the flame cannot have consequences otherwise than disadvantageous.

60A, *Wilson Street, E.C., Oct.* 25, 1905. C. J. ALEXANDER.

Fatal Acetylene Explosion.—A fatal explosion in connection with an acetylene-generator (apparently caused through tampering with the apparatus) occurred last week at Benwell, Newcastle; the victim being a boy 13 years old. The evidence given at the inquest showed that the lad's father, on going to work, left the generator with the cock at the top turned off; but very shortly afterwards a violent explosion was heard, and the boy was found dead in the room with the wrecked generator. It is supposed that deceased detached the tubing which led from the cock to the burner, and applied a light to the gas as it issued from the generator. The top of the apparatus was blown off, and evidently struck the boy on one side of the head.

Price of Gas at Meltham.—Among the matters contained in the minutes of the Gas Committee submitted at the last meeting of the Meltham Urban District Council, was a recommendation that the price of gas should be reduced 2d. per 1000 cubic feet, from the 1st inst., which would have made the price for lighting 3s. 1d., and for motive power 2s. 4d.; but, no doubt to the disappointment of the consumers, the Chairman moved that the minutes be confirmed with the exception of that referring to the prce of gas. He stated that since the subject was considered by the Committee, certain figures had transpired; and in the interests of everyone concerned, it was advisable the question should be again discussed by the Committee. This was agreed to.

Colonial Gas Association, Limited.—The accounts of the Association for the year ended the 30th of June show a profit, after writing off £792 for depreciation on works, of £6053, from which amount the sum of £1695 was paid in April last, as an interim dividend at the rate of 4 per cent. per annum. After providing for interest on debentures, &c., to the above-named date, there remains a balance, including the £812 brought forward, of £3691. The Directors recommend a dividend for the second half of the year at the rate of 6 per cent. per annum, free of income-tax, making 5 per cent. for the year, which will absorb £2543, and the addition of £303 to the reserve fund, increasing it to £3000. This will leave a balance of £845 to be carried forward. The Managing-Director in Australia (Hon. George Swinburne) reports that the works and mains are in good order, and that there was an increase of 6 per cent. in the consumption of gas during the year.

LEGAL INTELLIGENCE.

LAMBETH COUNTY COURT.—Tuesday, Oct. 24.

(*Before His Honour Judge* EMDEN.)

Vogan and Others v. South Metropolitan Gas Company.—Disputed Meter Registration.

The hearing of this case, adjourned from the previous Tuesday (see *ante*, p. 247), was concluded to-day.

Mr. HEWITT appeared for the plaintiffs; Mr. ATHERLEY JONES, K.C., represented the defendants.

Mr. HEWITT said he had closed his case at the previous hearing, but, by permission of his Honour, he would like to call another witness. Those he had previously examined had been called upon subpœna, and had been more unwilling witnesses than he had expected.

No opposition being offered,

Mr. *E. Pullman* was called, and said he had been a manufacturer of leather for 25 years, and his family had carried on the business of leather dressing for 180 years. The firm of which he was Managing-Director had supplied leather to meter manufacturers; and he was familiar with the leather used by them. It was known as "Persian Sheep," and was tanned in India with vegetable tannage and shipped to this country, where its manufacture was completed. In his opinion, vegetable tanning was not the most suitable for leathers intended for gas-meters. He held that a good mineral tanning would be infinitely superior. Vegetable tanning was far more easily affected than mineral by the action of the compounds to which gas-meters were subjected. Leather properly prepared ought to last in meters for a great many years without contracting. If the leather was seriously affected in a comparatively short period—say, in six or seven years—it would be certain that there was something wrong in the leather to start with, or that its original preparation had not been suitable.

Mr. HEWITT: Suppose, at the end of a given period, you find the leather seriously affected, must it have been affected in this way from the commencement of its use?

Witness: Yes.

And if leathers have been seriously affected by the gas, can they properly be used again?—If they are once seriously affected, I should say no.

Mr. ATHERLEY JONES remarked that his Honour was not trying the Gas Company for using again the leathers in these meters.

In further examination, witness said all leathers sold by weight were unfortunately liable to have their weight artificially increased. If glucose were used on the leather for meters, the tendency would be for it to get perfectly dry and very brittle. The natural tendency of leathers in meters was to get dry, and thus cause fast registration.

Cross-examined by Mr. ATHERLEY JONES: Although he knew that his firm had sold leather to meter manufacturers, he could not give the name of any they had supplied, as he had nothing to do with the commercial side of the business. He had made experiments as to the action of sulphuretted hydrogen and other gases on leather.

Mr. ATHERLEY JONES then addressed his Honour on behalf of the defendants; submitting that no case had been made out against them.

During the legal discussion which ensued as to the reading of certain sections of the Sale of Gas Act, 1859, and the Gas-Works Clauses Act, 1871,

Judge EMDEN said it appeared to him that there was little or nothing in the statute law to help them, and that therefore they would have to rely wholly upon the common law.

Mr. ATHERLEY JONES, in a subsequent part of his address, referred to the section in the defendant Company's Act of last session restricting the period to which claims could be made in respect of fast meters to the quarter previous to the discovery of the incorrect registration. He said a similar clause was in the Acts of practically all other gas companies, and was as much in the interests of the consumers as in that of the companies, because it was obvious that, in the vast majority of instances, when a meter went fast it was quite impossible to prove that it was registering for any time in favour of the suppliers. Now that the section was in the Act, an allowance would always be made for the previous quarter. Counsel went on to review the evidence of the witnesses who had been called, and argued that it would be impossible, on such flimsy testimony, to arrive at a conclusion favourable to the plaintiffs.

Judge EMDEN asked if there was any previous case bearing upon the issue.

Mr. ATHERLEY JONES replied that he could only find the case of the *Kendal Gas and Water Company v. Atkinson*, decided in the Kendal County Court by Judge Steavenson.* The plaintiffs sought to recover the price of the gas obtained by the defendant through a defective prepayment meter; but the Judge held that the Company could not succeed.

Judge EMDEN: Unfortunately, in that case the reasons which caused the Judge to arrive at his decision are not given.

Mr. ATHERLEY JONES argued that the case cited supported his view that whoever lost had to abide by the loss. It was the duty of the consumer to take the initial step to have the meters tested. The defendant Company had 300,000 meters on consumers' premises. Was it to be held that they must examine these meters frequently? It would be impossible to do so, at any rate if the price of gas was to remain at its present figure. The entries on the card attached to the meter, showing the consumption each quarter, were no guide to the Gas Company's officials; but they were intended to be, and were, a guide to the consumer, who knew the hours during which the gas was burned, and who could thus form an idea as to whether or not the meter was registering correctly. There was no obligation imposed upon the Company to do anything beyond what they had done in this case. There was also no

* See "JOURNAL," Vol. LXIII., p. 967.

evidence, worthy of the name, in support of the theory that the meters were registering fast before the period for which the Company had made an allowance.

At the conclusion of his address, Counsel stated, in reply to a question put by his Honour, that he did not propose to call any witnesses, as there was nothing, in his opinion, the defendants had to answer.

Mr. HEWITT said an understanding had been arrived at that any witnesses the plaintiffs desired to hear would be called in order to clear up matters which would have been the subject of interrogatories. What they especially desired to know was what was found in the two large meters when they were opened, and what happened to those meters.

Mr. *W. Palmer* was then called by defendants' Counsel, and, in answer to Mr. HEWITT, stated the 200 and 150 light meters were opened in his presence on the Company's premises. The top part was first removed so as to disclose the index. The leathers were not taken out—it was not usual to do so—but were examined by witness (who said he had had 30 years' experience) while they were still in the meter. He found they had contracted slightly and required oiling or redressing. The leathers were repeatedly dressed for a few days with almond oil and plumbago, while they were still in the box. A brush was used for the purpose. The meters were afterwards examined at the County Council's testing-station, and, being found satisfactory, were put into use again. When the meters were opened, the leathers appeared to be in fair condition, though slightly contracted.

Mr. HEWITT: Are you sufficiently an expert to say if leathers in meters ought to go for a long time without contracting?

Witness: Yes; for a number of years.

In further examination, witness said he believed that the reason one of the meters went fast was because it was registering for a gas-engine. This was the only case in which he had heard of four meters all registering fast.

Mr. HEWITT: There were five meters in all, and four registered fast. How do you account for it?

Witness: I should not have expected the leathers to have contracted in that short time, under normal conditions.

As an expert, do you consider it highly probable that these meters had been going fast for a long time before the previous Michaelmas?—No; my opinion is that they remained right until very recently, and that the leathers went wrong rather rapidly during the latter stage. As a rule, the process of contraction is gradual; but the rule is by no means universal.

In further examination, witness was pressed as to the reason for the four meters all going wrong within a comparatively short period; and he said that possibly the fire which had occurred on the premises might have been the cause with one of them which was situated near the scene of the outbreak. As to the other meters, he hardly knew their exact position.

By Mr. ATHERLEY JONES: He did not see any conditions in the leathers of the two meters he had opened which would lead him to believe that they were not in proper condition when put in. Those in the meters in question were in a good state for future use when they were re-dressed. His experience had convinced him it was impossible to fix the period when a meter first went wrong. The reason for the two large meters being brought into use again, and the small one not, was because there was an ample stock of the latter kind.

Mr. HEWITT then addressed his Honour on behalf of the plaintiffs; his main contention being that it was the duty of defendants to keep the meters in proper order, inasmuch as the consumer was forbidden to touch them. Counsel quoted cases where, owing to the impossibility of obtaining direct evidence, inferences were accepted by Judges and acted upon by them. In conclusion, he submitted that all the probabilities were in his favour.

At the suggestion of his HONOUR,

Mr. *A. E. Hayes* was called and examined by Mr. ATHERLEY JONES. He stated that he was a representative of the firm of Messrs. Parkinson and Cowan, who supplied meters to the leading gas undertakings in this country and elsewhere. He had had 20 years' experience in the manufacture of meters, and had not the slightest hesitation in saying that it was quite impossible to state how long a meter had been registering wrongly before this was discovered. His firm's meters were guaranteed for five years. If they went wrong before the expiration of that time they were taken back; so that it was obviously to the advantage of the firm, apart altogether from their reputation, to turn out good and reliable meters.

In cross-examination by Mr. HEWITT, witness said it was rather remarkable to find four meters all going wrong together. Temperature was the chief cause of incorrectness of registration in meters. If they stood still for a time, they were afterwards apt to go wrong. It was difficult to say whether meters were more liable to go fast or slow. His firm had supplied the leathers and the meters in this case. If the leathers went wrong in so comparatively short a period as four or five years, it was usually found they had been subjected to some strain.

Mr. HEWITT: Or that they were imperfectly prepared when put in?

Witness: Oh, no; I could not admit that.

Why?—The nature of the leather is to become hard when it is standing still.

Supposing a meter has not been standing still, and the leathers have not been subjected to any unusual strain owing to warmth, would contraction within five years prove that they were improperly dressed?—No; that does not necessarily follow.

In further cross-examination, witness said he thought good leathers ought to work correctly for from 20 to 25 years; but the time varied, owing to the nature of the conditions. His firm obtained their leather from Messrs. Turner and Sons, and did their own preparing. They soaked the leather for several weeks. Leathers which went wrong, as in this case, could be properly used afterwards.

Mr. ATHERLEY JONES said he would not waste time by calling other witnesses, who would one and all prove that it was impossible to say how long or how short a time would elapse before discovering that a meter had begun to register fast.

Judge EMDEN, in giving his decision, said: I feel I must hold there was a duty cast upon the Company to keep these meters in proper order to correctly register the gas which passed through them. It is evident that the meters were out of repair, and were registering too fast. On the evidence, it must be held that there is an inference—a strong inference—upon which I ought to act, that the meters were registering incorrectly for a longer period than the five months for which an allowance was made by the Company. I hold that plaintiffs are entitled to a larger sum than that which they received; but it is impossible to fix the amount, so I will leave that for the present. Judgment will therefore be entered for the plaintiffs for an amount to be fixed at a future date. The case is eminently one for appeal.

Mr. ATHERLEY JONES remarked that the Company would possibly not think it worth while to appeal if the sum assessed were small.

Judge EMDEN fixed the amount at £15.

Mr. HEWITT said, under the circumstances, his clients could not take exception to that.

Mr. ATHERLEY JONES said in all probability there would not be an appeal; but he could not say anything definite on the matter until the Directors of the Company had met.

Judge EMDEN said the moral of the case was that there ought to be some periodical testing of the meters—say every two or three years. This would be a protection to the consumer and to the supplier.

Mr. HEWITT remarked that the Gas Company should give a temporary supply during the testing period.

Judge EMDEN; Yes. With regard to costs, I think, under all the circumstances of the case, they ought to be taxed on the total of the amount claimed.

Mr. ATHERLEY JONES did not wish to wrangle upon the question, but would just point out that there was a measure of responsibility attached to the plaintiffs in this matter. There had been an easy and cheap procedure open to them—viz., to go before two Justices.

Judge EMDEN said the plaintiffs had evidently been put to great expense in getting up the case, and therefore he would certify for costs on the higher scale.

TOTTENHAM POLICE COURT.—Thursday, Oct. 26.

(*Before Dr.* F. H. DALY, *Chairman, and other Magistrates.*)

Sulphur in the Tottenham Company's Gas.

To-day the Tottenham and Edmonton Gas Company were summoned, at the instance of the Tottenham District Council, for supplying gas containing an excess of sulphur, contrary to the Company's Act. There were six summonses for alleged offences on different days.

Mr. A. E. BETHUNE appeared for the Council; Mr. W. WINDSOR represented the Company.

Mr. BETHUNE said the proceedings were taken under section 27, subsection 3, of the Company's Act, which provided that the gas supplied by them should not contain more than 20 grains of sulphur in any form in 100 cubic feet.

Mr. *A. E. Brown*, B.Sc., F.I.C., the Gas Examiner to the Council, gave the results of his tests on the days in question, which were as follows: Aug. 10, 24·5 grains; Aug. 11, 28·1 grains; Aug. 12, 26 grains; Aug. 14, 21·5 grains; Aug. 15, 21·8 grains; Aug. 16, 20·3 grains.

In cross-examination, witness said the test was a highly scientific one. The excess of sulphur could not be discovered by anyone using the gas in the ordinary way. The greater the excess, the more deleterious were the products of combustion. He should say that a larger number of gas companies were subject to the penal clause in respect of excess of sulphur than otherwise.

Mr. WINDSOR said he did not dispute the figures; but he asked the Bench to decide whether they were going to treat the summonses as constituting one offence or six separate offences. Sub-section 4 of section 27 of the Company's Act said: "Provided that no one penalty shall accrue or be recovered against the Company if it is proved that the deficiency of illuminating power or excess of sulphur was occasioned by unavoidable cause or accident, or, in the case of excess of sulphur, unless such excess shall amount to 2 grains on the average of six consecutive week days, or 10 grains on any one day." He submitted that a complaint had been made as regards six consecutive week days, and that this was only one offence.

Mr. BETHUNE decided to proceed with a view to the recovery of one penalty.

Mr. WINDSOR said that, for all practical purposes, the presence of sulphur in the gas did not affect its quality, nor did it affect health.

The CHAIRMAN: I do not quite agree with you there.

Mr. WINDSOR said he would in a minute. The whole of this question was referred by the Board of Trade to a Departmental Committee, who had made a report, upon which legislation must follow. It dealt with the subject of the presence of sulphur in gas.

Mr. BETHUNE: I do not know that the report of a Departmental Committee is evidence. It is not legislation.

Mr. WINDSOR: I do not say that it is; but the Bench will take it into consideration, when they consider the penalty to be imposed. I recognize that there must be a penalty. He then read the report of the Committee on the subject of the presence of sulphur compounds in gas, down to their recommendation that the obligation placed upon the Gas Companies with regard to the removal of these impurities should be abolished, but that testing for information only should continue to be made, in such manner and to such extent as might be prescribed by the Gas Referees. He pointed out that most of the Provincial Gas Companies were not subject to the penal clause at all in connection with the presence of sulphur compounds. The result o fthe Committee's recommendation had been that the London Gas Companies had applied to Parliament, who had abolished the clause, so far as it applied to them, in reference to sulphur compounds. Undoubtedly the Tottenham and Edmonton Gas Company would also be applying in due course; and they would then be freed from liability in this respect. The District Council evidently thought they would race the Company before they got to Parliament, in order to be in time to secure a conviction. The only way in which the sulphur compounds could be kept below 20 grains per 100 feet was by lime purification; but if the Company

adopted it, they would have the Medical Officer of Health coming to the Court for a summons against them for creating a nuisance. This was the first time that any proceedings of the kind had been taken against the Company; and it was done only at the eleventh hour. He urged that the justice of the case would be met by ordering the Company to pay the costs.

The CHAIRMAN said it was obvious that, sooner or later, the clause would be abolished; and therefore the Bench had decided to impose the nominal penalty of 10s. and costs. They thought the Council did quite right in bringing the matter before the Court.

Mr. WINDSOR said the Company consented to pay £5 5s. special costs.

Liability of Hirers of Gas-Cookers.

Mr. D. L. Harbottle, the Deputy Town Clerk of Bolton, appeared in a case of interest to gas consumers, in which the Bolton Corporation sued Charles Strafford for 24s., representing the balance due under a hiring arrangement for a gas-cooker. Mr. Harbottle produced the agreement, under which Mr. Strafford hired the cooker for five years at a rent of 1s. 6d. a quarter. It was fixed in the house which was then occupied by defendant. He afterwards left it, and went to another house where there was no gas, and requested the Corporation to take the cooker back and conclude the agreement; expressing his willingness to forfeit four quarters rent which he had paid. He now contended that his liability was ended by the Corporation taking back the cooker. The Judge held that the agreement was for five years, and not less. Defendant said the Corporation offered to take 9s. to settle. The Judge: You were foolish not to accept the offer. You would have saved 15s. He added that there was no legal defence to the action, and gave judgment for the amount claimed.

Damaging a Lamp-Post.

At the Southwark County Court last week, before his Honour Judge Addison, K.C., the Southwark Borough Council sued Messrs. Thomas Tilling and Co., Limited, to recover £32 4s., the cost of an electric light standard knocked down by one of their motor omnibuses. Mr. Courthope Munroe appeared for the plaintiffs, Mr. Charles Doughty represented the defendants. Mr. Munroe said the omnibus came full tilt at the standard, which was 26 feet high, and it fell—no one, fortunately, being injured. Contributory negligence could not be alleged against a lamp-post; but something of the kind was set up in the defendants' answers to interrogatories. The knocking-down was admitted; but it was added that "the lamp-column was not of sufficient strength for its presumed purpose at such a situation." The defence now put forward was that the steering-gear rod broke as the result of a latent defect which could not have been discovered. The rod was hollow and of steel, the thickness of metal being $\frac{1}{8}$ inch. Mr. H. G. Burford, the Manager and Engineer to the makers of the vehicle, would not admit that greater safety would be obtained by a solid forged rod, machined and milled. He thought an eighth of an inch of metal was absolutely safer than a solid bar. His Honour found for defendants, with costs.

Disputed Charge for High Service and a Garden.

At the Westminster Court on Thursday, before his Honour Judge Woodfall, the Metropolitan Water Board sued one Heathman to recover arrears of water-rate for a house in Fulham Park Gardens. The main point at issue was with reference to high service; and on behalf of the Board it was stated that the action was brought under the Chelsea Water Company's Act, which authorized a special charge to be made if the service was more than 10 feet above the level of the pavement, This was provided by section 60 of the Company's Act of 1852. There was also a question as to the garden of the house. The defendant had a tap in front and two taps behind; and he contended that the garden was included in the rateable value of the premises. The amount that was claimed, with the exception of these two items, had been paid into Court. The minimum charge for the garden was 10s. The plaintiffs' contention was that if a man had the use of water for a garden he must pay for it. His Honour put a question as to the two services. Upon this point William Field was called, and said there was one supply-pipe from which two cisterns were filled—one on the first floor, and the other on the second floor. Plaintiffs' Solicitor said their contention was that if there were two taps from the main at a height of more than 10 feet it was the same as two deliveries of water. The man who had the privilege of two cisterns should pay for it. His Honour referred to the section cited, and at once said defendant could not dispute the two high services; and he thought the garden must also be paid for. Defendant said he had never paid either one or the other. Judgment was given for the plaintiffs, with costs.

Cheap Electricity at Watford.—At the last meeting of the Watford District Council, a letter was read from a firm who are erecting printing works in the neighbourhood, who stated that they agreed to accept electricity from the Council on the following terms: 1d. per unit, all plant to be electrically driven, the contract to be for five years, the minimum quantity to be consumed to amount to £400 per annum after the first twelve months' working; lighting other than by arc lamps not to exceed 20 per cent. of the whole. The Chairman (Mr. R. A. Thorpe) said the question had been gone into carefully. The consumption would mean 100,000 units per annum. The Council had to take a cable to the place, put in transformer stations, and lay down plant, and this would mean an outlay of £2500; but it would come out of the loan of £25,000 they had already obtained. They endeavoured to get a little more than 1d. per unit; but they were told it was either that or nothing. The Council discussed the terms at some length; and the Chairman, in reply to a question as to profit, said that 6 per cent. on £2500 came to £150 per annum. They were asking for £400; and the difference was the profit. Eventually it was agreed to accept the terms stated.

MISCELLANEOUS NEWS.

GAS COMPANIES' PROTECTION ASSOCIATION.

The Eighth Annual General Meeting of this Association was held on Friday, at the Westminster Palace Hotel—Mr. H. E. JONES in the chair. He was supported by the Vice-President (Sir George Livesey), most of the members of the Committee, and a number of ordinary members.

REPORT AND ACCOUNTS.

The SECRETARY (Mr. F. E. Cooper) read the notice convening the meeting, the minutes of the last meeting (which were confirmed), and then the Committee's report and accounts. The report was as follows:

The Committee beg to present their report upon the proceedings of the Association during the past year.

The Committee last session directed the attention of Gas Companies affected by applications for Bills containing powers as to electricity, and Electric Lighting Provisional Orders, promoted by Local Authorities, to the advisability of objecting to such Bills or Orders, with the view of securing the insertion therein of the Northumberland Clause. In consequence, several Gas Companies obtained the insertion of the clause in Bills or Orders promoted by Local Authorities.

The Committee desire to point out that the propriety of the insertion of the clause in question in Bills containing powers as to electricity, and Electric Lighting Provisional Orders, promoted by Local Authorities, is now generally recognized; and in some cases promoters of Provisional Orders inserted the clause in the draft Provisional Orders deposited by them with the Board of Trade.

The Committee watched the Supply of Electricity Bill, which was again introduced into Parliament during the session, but the same was not proceeded with.

A Bill to amend the Weights and Measures Act, 1899, respecting the sale of coke by weight (the Sale of Coke Bill) was introduced into Parliament; and the Steam Engines and Boilers (Persons in Charge) Bill was re-introduced. The Committee took steps in opposition to both Bills, which failed to pass into law.

The London County Council (General Powers) Bill, promoted by the London County Council, sought to confer undesirable powers as to the wiring of consumers' premises upon Borough Councils owning electric lighting undertakings. An instruction to the Committee, to whom the Bill was referred, was moved in the House of Commons to omit from the Bill the part which contained the provisions in question. This motion was supported by the Association; but it was lost on a division by a majority of six, the numbers being—For the motion, 190; against, 196.

The Committee considered the point raised at the last annual general meeting of the Association as to whether an official receiver or trustee, after a debtor has been adjudged bankrupt, could compel a Gas Company to furnish a supply of gas, without such receiver or trustee guaranteeing to pay the arrears of gas-rent then due; and as the matter was one of interest to Gas Companies, they decided to take the opinion of Counsel on the question, and upon other points arising in connection therewith. They accordingly caused a case to be submitted for the opinion of Mr. Shiress Will, K.C., whose opinion was against the suggested liability.

The Committee also submitted a case to Mr. Danckwerts, K.C., upon the claim made by the Commissioners of Inland Revenue to be entitled to the production to them of a King's Printers' copy of an Act of Parliament dissolving a Company incorporated under the Companies' Acts, and re-incorporating such Company as a Statutory Company, duly stamped with *ad valorem* conveyance duty in respect of the property of the Limited Company vested by the Act in the Parliamentary Company. Mr. Danckwerts' opinion was in favour of the contention of the Inland Revenue Authorities.

The Secretary will be pleased to produce the cases and opinions to any members interested in the questions raised; and it may also be mentioned that both opinions are set out at length in the "JOURNAL OF GAS LIGHTING." [See issues of Dec. 20, 1904, p. 901, and July 4, 1905, p. 18.]

The Committee have watched with interest the recent controversy affecting the three Metropolitan Companies as to purification and testing of gas. After two years of discussion, a Bill dealing with these matters was introduced into Parliament last session by the London County Council, which, after amendment in several important particulars, at the instance of the Companies concerned, duly passed into law. By this Act, a more equitable system of testing for illuminating power is provided; and the onerous sulphur clauses which had prevailed for about thirty-five years are repealed. The Committee suggest that this Act forms a useful precedent for adoption by Provincial and Suburban Companies who find the conditions imposed upon them in these respects too onerous.

The Association has, during the period now under review, been of assistance to Gas Companies by giving them advice upon many points of a varied character arising in the conduct of gas undertakings. Among the matters upon which the Secretary has been consulted may be mentioned the following: (1) Deduction in income-tax return for depreciation of gasholders. (2) Proper amount of reserve fund. (3) Right of gas companies to require promoters of a tramway at their own expense to remove gas-mains interfered with in construction of tramway. (4) Right of electric power company to supply energy for lighting purposes to rural district council and private consumers. (5) Nature of protective clauses gas companies should seek to have inserted in Bills affecting their interests. (6) Right of a councillor, being a shareholder in a gas company, to take part in discussion on public lighting. (7) Liability of company for injury caused by explosion of gas. (8) Mode in which loss incurred by local authority in the supply of electricity should be met. (9) Remedy of companies in the case of local authority refusing to give notice before digging or sinking trench for the purpose of laying electric cables. (10) As to whether position of director of a company, being in debt to such company, or having borrowed money on the security of certain shares in the company, is affected. (11) Power of companies to lay mains under public footpaths, instead of under roadway. (12) Necessity of gas companies complying with bye-laws of local authority in respect of erection of new gas-works. (13) Power of companies to refuse supply of gas to tenant on landlord having previously signed an agreement to take electric light. (14) Liability of a gas consumer for amount of money stolen from a slot meter. (15) Liability of gas companies to cost of service-pipe from main to consumers' premises. (16) Electrolysis. (17) As to the right of gas examiner to retain possession of key of testing-room. (18) Right of local authority's surveyor to demand to be furnished with copies of gas companies' acoounts for rating purposes. (19) Right of a gas company to an injunction restraining a local authority from altering position of gas-mains. (20) Power of gas

company to obtain Provisional Order extending limits of supply. (21) As to legality of fee charged by clerk of peace on filing of gas companies accounts.

The present number of members is 97 ; there being 9 new members last year and 3 withdrawals—one of the withdrawals being attributable to the fact that the gas undertaking had been acquired by the local authority.

The Committee again desire to urge upon all gas companies the advantages they obtain from membership of the Association, which confers influence upon themselves as well as upon the Association.

In pursuance of No. 9 of the Association's rules, the following gentlemen retire from the Committee : Mr. Frank Bush (South Metropolitan Gas Company), Mr. W. R. Cooper (Banbury Gas Company), Mr. Henry Hart (Canterbury Gas and Water Company), Mr. H. E. Jones (Commercial Gas Company), Chairman, Mr. William King (Liverpool United Gas Company), Mr. W. R. Phillips (Hitchen Gas Company), all of whom, with the exception of Mr. W. R. Cooper, offer themselves for re-election.

Mr. Thomas Berridge, of the Leamington Priors Gas Company, has been nominated for election to the Committee.

The accounts showed that the income of the year (including £367 3s.) brought forward amounted to £809 11s. 8d. This included interest on £900 of 2½ per cent. consolidated stock. Deducting the expenditure for the year, the amount remaining to be carried forward is £415 3s. 4d. The outstanding subscriptions total to £17 17s.

The Chairman, in moving the adoption of the report and accounts, said he had often wondered what was the practical use of reading minutes. He knew that it was proper legal form to do so ; but they were more or less all old affairs. On this occasion, however, the minutes had reminded them of one or two matters.

THE REMOVAL OF THE SULPHUR RESTRICTIONS.

First of all, their Vice-President (Sir George Livesey) was at the time of the last meeting on a bed of sickness ; and from that room they sent him a message of sympathy, moved by the premier Gas Chairman of the world (Sir William Makins). He (the Chairman) thought they were all delighted to see the Vice-President with them that day, strong and hearty. Not in vain had he left that bed of sickness, because, as the report told them, a very salient and most important change had come over the circumstances of gas companies—the pioneer movement in which they owed to Sir George Livesey—of having the bogey of sulphur impurity well hustled, heckled, examined, and pecked at, until it was shown in all its nakedness before a Committee of the highest scientific attainment, of which Committee one member of their own Committee (Mr. William King) was a member. Stripped of all its glamour, it turned out to be such a despicable phantom that the Committee gave a strong report to the effect that there was no occasion for this testing, which had been grinding their faces so long, to be continued. He used the expression "grinding their faces." To members attached to Provincial gas companies, where the testing was either not done at all, or, if done, was more often than not only once a month or now and then, they did not know what it was to suffer from this capricious, fugitive, and unstable impurity. It complicated their processes so that they had to bring the sulphuretted hydrogen forward into the most prominent part of their plant, and, in doing all they could to clear away the bisulphide of carbon, they rendered themselves doubly liable to sulphuretted hydrogen. In the country they had not the Act administered as the Companies had had it in London by a hostile authority, and a distinctly hostile authority, delighted to drag them into a police-court, and who employed men of scientific and chemical attainments and distinction to urge on this process. He had known of a gas examiner being dismissed by the authorities because he did not get convictions against the Gas Companies. When a gas examiner had a distinct idea that, unless he brought something home to a Gas Company, he would not continue to hold his position, then those present would understand that this kind of thing had been a perfect curse to the London Companies. Administered as it had been, they had not even the consolation, while enduring all this pain, anxiety, and worry (which had kept him and his officers out of bed many a night), of knowing that their gas was any the better for it all. When he had plodded through the snow from his house to the works, with some apprehension of proceedings in police courts through some unhappy change of temperature or change of coals, he had often wondered whether such life was worth living. (Laughter.) However, they were indebted to the courage, perseverance, and expenditure of their worthy Vice-President, Sir George Livesey, in demonstrating the absurdity of all this penalizing. Those among them who had any knowledge of their profession, and really knew what all this meant, had no sentiments but of gratitude in remembering that, for all time, the heavy yoke had been lifted from their necks by Sir George Livesey. They must therefore be thankful that he did recover from his illness, that he returned to the charge, and that, in the very year of his recovery, they were able to overthrow this—he hardly knew in what terms to describe it—bugbear ; it was the sort of thing that was put in a field as a scare-crow.

Sir G. Livesey : It was much more harmful than a scare-crow.

The Chairman (continuing) said it often brought the Companies into the police court, where the authorities were delighted to see them, because then it was said that the Companies were making "bad" gas.

THE ASSOCIATION AND THE SMALLER COMPANIES.

The report dealt with a great number of subjects. A long list had been read by the Secretary ; and some of them might appear to be somewhat trivial to many of the members. But he could assure those present that several of the subjects were of infinite service to those representing the smaller companies who belonged to their ranks. The officers of these companies had often puzzling questions of this sort, and did not know where to look for the authorities on the question. They therefore wrote to the Secretary and got answers. Many of the members—those connected with the larger companies—could doubtless find answers at once to some, at least, of the questions ; but all the members were not in the same fortunate position.

THE NORTHUMBERLAND CLAUSE.

With regard to the report generally, it was seen that gas companies had been more successful, in respect of the Bills of public authorities connected with electricity, in securing the Northumberland clause. They at one time began to despair a little (as in the case of electrolysis) in getting this clause through ; but the tone of Parliament had now changed very much over municipal expenditure. Parliament was now watching and limiting the degree to which this sort of trading should go, and therefore it would be easier in the future than in the past to secure the clause—partly he might claim through the perseverance of the Association in drawing attention to these matters—to get the expenditure in this connection regulated. The experience of the past session would therefore be an encouragement to the members to renew their efforts wherever they were affected by these matters.

RATING.

One of the questions to which their Secretary had referred was on the subject of rating. He had on a former occasion alluded to the Association acting as watchdogs in Parliament. But there were also other matters. The Association gave them the opportunity of calling attention to the very material changes in such circumstances as those affecting rating ; and they had got to look into the question of rating just now. The coin-meter consumer had very much altered the rateable value of gas undertakings, and had very much reduced it. For about 30 years the auction clauses had been in operation ; and capital had been raised by prosperous companies on terms of 4½ per cent. for the investor's money. For some time this had been going on ; but something like three or four times the original number of consumers had been added ; and therefore three or four times the number of gas-meters and of stoves, and a great deal of extra internal fitting, had been added, upon which—according to the fiction of the law and the practice of the rating surveyors in respect of the hypothetical tenant (who was a most extraordinary character)—there had been an entire alteration of the position of the hypothetical tenant, who had now something like one-third of the entire capital of the undertaking devoted to his purpose. If they took 17½ per cent. on one-third of the money, and then, under the legal fiction, they allowed the landlord 5 per cent., they would see how impossible the problem became to satisfy 15½ per cent. on one-third of the capital, and 5 per cent. upon another one-third of the capital that was raised at 4½ per cent. When gas companies were paying 10 per cent., and putting by large reserve funds, and many of the meters belonged to the consumers themselves, they were the happy hunting-ground for rating surveyors. To-day these gentry were finding their level, and saw that they could no longer get enormous percentages out of the inflated heavy burden upon gas companies. He mentioned this because he hoped it would go forth to their distant members that, in the face of these aggressions that were constantly being put upon them, there was a Bill in Parliament for bringing about a readjustment of the assessments of the whole country quinquennially. The quinquennial reassessments in London had been for some time (with rates growing as they were) very unjust indeed. They should remember that their circumstances were very different now ; and the liberality with which they treated their slot consumers should help to relieve them from paying undue assessments. This was not specially mentioned in the report. But he regarded the Committee as the members' watchdogs ; and he was the one who was barking at the moment. (Laughter.) He did not think he need elaborate the points of the report. They trusted the Association was useful ; they trusted the Committee were useful ; and they trusted the Companies would stick to them. Although they had not taken part in any great fight, and they could not really do that (as Sir William Makins had pointed out) without subscribing large funds, they did think that in the work of the past—by calling the attention of their members to important questions, by responding to their inquiries, by taking Counsel's opinion, and, in the session before last, by actually taking part in parliamentary proceedings (though they were not likely to do that again without the special authority of the members)—though the work had not been very imposing, it had been very useful. The Secretary reminded him that he had not announced that the Committee had decided to invest another £200 in Consols. He begged to move the adoption of the report and accounts.

MUNICIPALITIES AND GAS COMPANIES.

Alderman Hart (Canterbury), in seconding, said he fully endorsed what had been said by the Chairman about the increase of taxation by Municipalities. He happened to hold a position both in a Gas Company and in a Corporation ; so that he was able to judge of the two. And he did think that they, as gas companies, were not fairly or justly dealt with. In the municipalities, the gas companies ought to have representatives ; they ought to have a vote. In many places, the taxation of gas companies had doubled of late years ; and yet they had no influence upon municipal expenditure. The public bodies did what they pleased both with the public lighting and with the gas companies who contributed very largely to their expenses.

Sir G. Livesey : In many places we are the largest ratepayers.

Alderman Hart : That is so, and yet the Gas Companies are not represented at all. It was said, he continued, that representation and taxation should go together ; but these things were not dealt with in the interests of gas companies in the cities and localities in which they were situated. Therefore he considered this question should be well considered by all the gas companies throughout the country, and especially by the Association. They were, as it was said, a "Protection" Association ; and they would, by taking steps to get representation, protect their interests. He thought this was a question that ought to be considered by them, because the rates that were put upon gas companies affected them considerably. He was glad to see the finances of the Association in a sound position. The history of the Association seemed a prosperous one. He hoped those companies who were not already members would read in the "Journal of Gas Lighting" of their work, of their intentions, and of the strong watchfulness the Association gave to the interests of the gas companies of the country.

FREE ELECTRIC WIRING.

The Chairman said there was one word of explanation he wished to make. The report stopped short on the question of the Bill promoted by the London County Council, clauses in which were intended to enable them to lend money to the Borough Councils for free wiring.

The Association opposed the Bill; and when it reached the House of Lords, the power was struck out.

SUGGESTED COMBINATION FOR THE RELIEF OF COMPANIES UNDER SULPHUR CLAUSES.

Sir GEORGE LIVESEY said the first thing he had to do was to thank the Chairman for his exceedingly kind remarks personal to himself; and the meeting for the way in which they had received what the Chairman had to say. The other matter personal to himself was with reference to the struggle to get rid of the sulphur clauses. This matter had been on his mind for he did not know how long. He retired from his position of Engineer to the South Metropolitan Gas Company in 1882—23 years ago; but he always felt himself that he was an Engineer rather than a Director, and his sympathies had been, and were, with engineers. He could endorse all that had been said as to the anxiety that the sulphur test had caused. The other matter referred to by the Chairman had reference to the wiring clauses in the London County Council Bill. The House of Commons altered the clause in such a way as to destroy the free-wiring part of it. The Borough Councils were to be allowed to wire the houses, but the consumers were to pay for it directly or indirectly. When the clauses came to the House of Lords, they struck them out altogether. His object, however, in addressing the meeting was a different one. He saw that they had now 97 members, while there were, he believed, between 450 and 500 gas companies who had statutory powers—either Acts of Parliament or Provisional Orders; so that they had not got even one-quarter of the total number of gas companies yet in the Association. He was afraid there was a great deal of apathy on the part of gas directors; and many of them were apt to say, "Well, what are we to get out of your Association." They took a very narrow view of the matter. Now it had occurred to him (he thought, however, the idea was the Chairman's before it was his own, or, at any rate, Mr. Jones had mentioned it to him) whether the Association could not undertake some general work for the benefit of the gas industry. There was something to their hand just now. It seemed there were, out of the 450 odd gas companies, only about 45 who were under the sulphur restrictions; but, to get free of them, it was necessary to have an Act of Parliament. Their Chairman had been clever enough to induce the Wandsworth Borough Council to agree not to test the Wandsworth Gas Company's gas for sulphur. That was a feather in his cap. To have succeeded in converting a Borough Council to the giving up of testing was most extraordinary. But as this would not succeed generally, could not the Association do something in the matter? Of course, they could not promote a General Bill for the whole country; but he should like to ask the Secretary whether it would not be possible to do this, to introduce a Bill to free all the Gas Companies that were under the sulphur clauses from the restriction. To do this, he supposed it would be necessary to set out every Gas Company's name, independently and separately, in the preamble. He merely threw this out as a suggestion, whether the Association could not take up this matter, and communicate with the 45 Gas Companies, asking them whether they would contribute their quota to the expenses, *pro ratâ* according to their consumption, and introduce a Bill. He asked Mr. Cooper what such a Bill would cost, and suggested £1500 at the outside.

The SECRETARY: If the different local authorities opposed it, it would cost quite £1500; if they did not, £750 might cover it. He subsequently pointed out that the amount (£750) mentioned by him would not include the cost of publishing the Parliamentary Notice in the newspapers, as this would be a heavy item, owing to the fact that the notice would have to be advertised in a newspaper circulating in the district of each Company affected by the notice.

Sir G. LIVESEY remarked that any way it would be but a small sum spread over 45 companies. This would be a useful work for their Association to take up; and it would show that they were alive to the interests of the gas industry, and anxious to free it from objectionable restrictions. He did not know whether the idea was worth entertaining; but that was broadly what he had to suggest—that the Association should place itself in communication with all the gas companies under sulphur restrictions, and ask whether they were willing to join in an effort to get free. He thought if the names of the companies were inserted in the notice, it would be valid.

The SECRETARY: If each Company sealed the petition for the Bill, every Company would be a promoter of it. I do not see that it matters what the number is.

Sir G. LIVESEY: So that it is a practicable thing?

The SECRETARY: I think so.

Sir G. LIVESEY: Then it is a thing well worth consideration. If the Bill passed, it would, he continued, relieve the gas companies of the United Kingdom from this objectionable restriction; and it would show the gas companies generally that the Association were doing good work.

THE ILLUMINATING POWER QUESTION.

There was another point upon which he did not think they were quite right. Although this was rather a delicate matter, he felt bound to say what he thought about it. While the Departmental Committee of the Board of Trade did very good work on this sulphur question, they made a most unfortunate mistake in another direction, in recommending that gases of different qualities should be burned at the 5 cubic feet rate. That was impossible. Their recommendation cast an immense burden on the London Gas Companies, in connection with the London Gas Bill last session, not only in great expense but great effort, great thought, and great anxiety. The Companies did not succeed in the House of Commons, because the Committee of that House said: "We cannot go beyond, or pass over, the recommendation of the Departmental Committee." When, however, the Bill got to the House of Lords, they threw out the recommendation, and said the proper way for testing gas was (as it had been) by regulating the quantity of gas consumed to the 16-candle standard. The matter was one that was rather beyond the province of the Association. It was rather a matter for the Institution of Gas Engineers; but he was a little doubtful whether it was quite ripe for action this year. The London County Council stood out for burning gas of 14 candles and 16 candles at a uniform rate of 5 cubic feet an hour. If the gas was always of 14-candle illuminating power, and always of the same composition, they might have a burner consuming at the rate of 5 cubic feet an hour. That would be doing justice. Seeing, however, that some of the gas supplied was a 16-candle mixture of water gas and coal gas, some of the 14-candle also a mixture of water gas and coal gas, and some of the 14-candle simple coal gas, for every one of these different qualities of gas a different rate of consumption was necessary, in order to get the best effect with the same burner. But after the House of Lords declared that the old system of testing was the right one—the table photometer, and burning at the 16-candle rate all the qualities of gas—the London County Council and the Gas Companies came to some sort of an agreement. The Council said, "We wish to retain the 5 cubic feet per hour. That is all we have got out of the Bill." Then his friend, Mr. Jones, took an active part in the matter; and here he (Sir George) ought to say a word for Sir William Makins. He had been very ill; and it was to his (Sir George's) great regret that he was not with them that day. The last he heard was that he was better; and he hoped he would soon be thoroughly restored to health. Sir William took a very strong part in promoting the union of the three Companies. They acted together; and the result was they succeeded on most points.

A SUGGESTED TEST BURNER.

The illuminating power test clause, however, now stood something in this way: That the gas should be tested with the best burner for developing the greatest amount of light, burning at the rate of 5 cubic feet an hour. There were only two ways of burning gas to the best advantage—one was to regulate the gas, and the other to regulate the air. They could not fix the gas supply and fix the air supply too. They must regulate the one or the other. The Companies were now waiting to see what the Referees were going to do. Meanwhile the London Companies had agreed on a burner. Mr. Carpenter had devised one that had been approved by the other two Companies; and they had submitted this burner to the Referees. If the matter had been quite ripe, he should have suggested that the Association should take it up in conjunction with the Institution of Gas Engineers. But it was not quite ripe. The sulphur question was; and he put it forward as a suggestion.

SOUTHERN GAS COMPANIES AND THE SULPHUR RESTRICTIONS.

Mr. C. E. BOTLEY (Hastings) said the matter was a most important one for all companies in the Provinces who were under the sulphur clauses. He had brought forward the question in Committee that day, because several of his colleagues in the South had spoken of the desirability of promoting a Bill which would relieve them of the obligation. They saw there was a chance for freedom in the gas industry; and with the competition of electricity, suction-gas plants, power gas, and all these various things, it became necessary that they should have freedom, in order to compete with them. In asking Parliament to relieve them, they were not asking too much.

Sir G. LIVESEY: The South Suburban Gas Company, as well as the London Companies, got relief.

Mr. BOTLEY (proceeding) said that for some time he had been priming the Hastings Corporation and the Town Clerk as to the course of events in this regard. His Company were under the obligation to test for sulphur; and they met it fairly successfully. But as had been pointed out, these sulphur compounds were extremely capricious and extremely uncertain; and they were never sure when the gas examiner came down whether or not he would find them wrong for a day or two. He knew of one company's gas that was tested very rigorously for sulphur compounds; and they were always being called before the Corporation for being in excess. They were now under an altered arrangement; and the gas examiner did not test. The Corporation had lost so much money over the electric light that they abandoned the test; and the gas manager had abandoned sulphur purification—(laughter)—and he had not had a single complaint. Even if they could not get all the companies to contribute to get relief, those belonging to the Association might be asked.

Sir G. LIVESEY: It would be fair at first to ask them all. It would be a benefit to them; and those who derived the immediate benefit would share the expense.

Mr. BOTLEY said that anyway they would add to the importance of the Association by taking up the matter; and those who were outside would perhaps appreciate the Association more in the future. He hoped something would be done to bring this matter forward, and was perfectly sure the Companies in the South would fall in with it.

ANOTHER GRIEVANCE.

Mr. T. BERRIDGE (Leamington) said there was another grievance. Many gas companies in supplying gas to the public lamps had to supply at the lowest price charged to consumers. They were therefore not in a position to reduce their price for gas-engines to compete with suction gas or electricity, If they could have this obligation removed, it would be an advantage.

The CHAIRMAN said he thought that was a little outside what they had been discussing. He was particularly obliged to Sir George Livesey and Mr. Botley for bringing this matter forward. It had been present in his mind for a long time; and he wrote to Sir George Livesey to ask him whether it would not be possible to club the companies together for this very purpose. Mr. Botley had brought up a list of 45 companies——

Sir G. LIVESEY: That was taken from the South Suburban Company's list.

Mr. BOTLEY agreed.

The CHAIRMAN remarked that evidently the figure came from the one source. However, he had thought that, at first, a few of the Companies round about London might go for a little "Omnibus" Bill. But he considered the suggestion of Sir George and Mr. Botley was one they could all support, that they should have an Omnibus Bill, aided by the Association and as many as possible of the companies concerned. It appeared to him that a Bill of this sort would not cost more than £1000. When the London County Council Bill was before

Parliament, the London Companies surrendered their own Bill, and allowed the County Council to take the matter through, so that the blessing came from their former opponents. Sir George had referred to him as having affected the minds of the Wandsworth Borough Council in this matter. He did it by sending them the Bill brought in by the London County Council, and promoted under their ægis. He agreed with Sir George that they could not yet touch the illuminating power test. It would, of course, be desirable if they could; for it would be a grand thing for gas companies if they could get a common denominator in the matter of illuminating power. They must get it, because it was unfair—it was distinctly unfair—that companies before being penalized upon it should not have every chance of the full value being determined.

The report and accounts were then unanimously adopted.

CONCERTED ACTION AGREED TO.

The CHAIRMAN asked whether he might take it that the members agreed with the suggestion made by Sir George Livesey, and supported by Mr. Botley, that the Association should take the steps necessary for bringing the companies concerned together for promoting a joint Bill in the coming session.

Sir G. LIVESEY said he would like to propose that this meeting request the Committee to take into consideration whether they could not in the next session promote a Bill to relieve all the companies at present under the sulphur clauses from the obligation to purify gas from sulphur compounds, and that all the companies interested be requested to subscribe the costs of the Bill—the Association meeting the expense to the extent of £150. He noticed that the Association had in hand £1300 odd.

Mr. WILLIAM KING: You will probably have some of the corporations fighting it to the death.

Mr. BOTLEY seconded the motion.

Mr. E. W. H. EADY (Southampton) remarked that his Company were under these sulphur restrictions. In the next session of Parliament, they were going for a new Act for further capital and other powers. The only question before his Directors to settle now was what they were going to ask for. There was the question of illuminating power, sulphur restrictions, and so on. He would be happy to support the motion, and to bring before his Directors the suggestion that all companies should help the Association in a joint effort to free Provincial companies from these restrictions.

Alderman HART suggested that, if the Association contributed £100, it was as much as they should be expected to do.

Sir G. LIVESEY asked whether £100 would meet all the preliminary expenses.

The SECRETARY pointed out that the preliminary expenses would considerably exceed this sum, seeing that the notices would have to be advertised for two successive weeks in a newspaper published in each district affected.

Sir G. LIVESEY thought the first thing to be done was to ascertain whether the companies affected would join. Those who would not, could be left out.

The motion was carried unanimously.

Sir G. LIVESEY: Then the matter is referred now to the Committee.

The CHAIRMAN: Yes; I think the expenditure should be limited to £100.

Sir G. LIVESEY: I would rather have that left to the Committee.

The SECRETARY: Then make it such sum as the Committee may think proper.

This was assented to.

VOTE OF SYMPATHY WITH SIR WILLIAM MAKINS.

On the suggestion of the CHAIRMAN, it was agreed to send a message of sympathy to Sir William Makins in his illness.

THE COMMITTEE.

On the motion of Sir G. LIVESEY, seconded by the CHAIRMAN, Mr. T. Berridge, of Leamington, was added to the Committee.

Proposed by Mr. A. CANNING WILLIAMS (Reading), seconded by Mr. P. ALLISON (Louth), the members of the Committee retiring by rotation and who offered themselves for re-election were continued in office.

Moved by Sir G. LIVESEY, and seconded by Mr. R. O. PATERSON, a vote of thanks was passed to the Chairman.

The Chairman's response ended the proceedings.

CEARA GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held on Friday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. J. DARELL BLOUNT in the chair.

The SECRETARY (Mr. George R. Guyatt) having read the notice convening the meeting, and the Auditor's report,

The CHAIRMAN said that there were a few remarks he would like to make before moving the adoption of the report and accounts—two or three items he wished to draw attention to. Coals carbonized showed rather an increased amount; but, on the other side, there was a larger supply of gas for private and public consumption, which more than met this addition. The general charges were also somewhat higher; but this was owing to a change of management having been made during the year. Mr. George Martin, who was their Manager out at Ceara—and a very efficient Manager he was—was, on account of his private affairs, obliged to give up his post and return to England; and the Directors had appointed in his place Mr. Herbert Gandon, who they hoped would prove an exceedingly serviceable Manager. As to the other items in the accounts, they were not very much different from what they had been before. Exchange showed a better figure than it had hitherto done; and the shareholders would perceive that the Board had reduced the Directors' fees by the non-appointment of a successor to Mr. Arthur J. King. This made a difference of £100. It was not a large amount, but still it was something; and the work had been carried on, he thought, without a successor to Mr. King, in a satisfactory manner. The Board hoped this would continue to be the case, and that they would not be under the necessity of appointing another Director. He concluded by moving the adoption of the report and accounts.

Mr. F. A. WALLROTH seconded the motion; and it was unanimously agreed to.

On the proposition of the CHAIRMAN, seconded by Mr. F. W. BROTHERS, dividends were declared of 5 per cent. on the preference shares (less income-tax) and of 3 per cent. on the ordinary shares (tax free) for the six months ended June 30.

The CHAIRMAN moved, and Mr. THOMAS GUYATT seconded, the re-election of Mr. Brothers as a Director.

This was carried; and Mr. BROTHERS made brief acknowledgment of the confidence reposed in him.

Mr. T. M'MAKING moved, Mr. HOLDERNESS seconded, and it was unanimously agreed, that Mr. Magnus Ohren should be re-appointed to the position of Auditor.

Mr. T. FISHER proposed a vote of thanks to the Chairman and Directors. He said the position of the undertaking was very satisfactory to the shareholders; and it was their duty to express their thanks to the Board for the way in which they had conducted the affairs of the Company.

This was seconded by Mr. M'MAKING, and carried.

The CHAIRMAN, having acknowledged, on behalf of the Directors and himself, this expression of confidence, proposed a vote of thanks to the officers in Ceara and London. He remarked that the Board were, of course, very much dependent upon the exertions of the officers for carrying on the business in a satisfactory manner. Mr. Martin, who had unfortunately had to retire, had, the Directors considered, conducted affairs excellently; and under Mr. Gandon, who had been appointed in his place, they had every confidence that the good management would be continued.

Mr. WALLROTH seconded the motion; and after it was carried,

The SECRETARY said he would have very great pleasure in informing the Manager at Ceara that such a vote had been accorded to the officers and staff; and he also wished to thank the shareholders on his own account.

DANISH GAS COMPANY.

Annual Reports of the Directors and Engineer.

In the report which the Directors of this Company will present at the annual general meeting on the 9th prox., they state that the net revenue for the year ended the 30th of June was £53,818. Adding to this sum the amount brought forward, the total standing to the credit of the profit and loss account is £85,843. Compared with the previous year, there was an increase of 4·57 per cent. in the quantity of gas sold in the twelve months covered by the report; but the net revenue shows a decrease of £6900, caused mainly by an increased expenditure in connection with the plant, depreciation of meters and material, additional taxation in Denmark, and the special expenditure in connection with the Company's staff referred to in the preceding report. There was a considerable saving in the cost of coal; but it was more than counterbalanced by the low price of coke prevailing during the past year, coupled with the lower selling price of gas under the sliding-scale. After providing for the payment of interest on the debenture capital, &c., and transferring £10,000 to the depreciation account and £1000 to the reserve account, there remains £63,883 available for distribution, The preference dividend of 6 per cent. for the year to June 30 last and an interim dividend of 4 per cent. on the ordinary shares have already been paid; and the Directors recommend a further dividend of 5 per cent. on the ordinary shares. These dividends amount altogether to £37,500, and leave a balance of £26,383 to be carried forward. In June last, the Chairman and Mr. Birchenough visited and inspected the Company's works. During their stay at Flensburg, a meeting with the Burgomaster and members of the Gas Committee took place with reference to the question of the new works. The Directors report that, though the definite authorization to build has not yet been received in Flensburg from Berlin, all disputed points are settled, and the erection of a much-needed gasholder on the new site is in progress.

Accompanying the Directors' report is that of the Engineer (Mr. A. W. Edwards). He states that the total consumption of gas during the year ending June 30 last was 891,040,000 cubic feet; being an increase of 38,981,000 cubic feet, or 4·57 per cent., as compared with the preceding twelve months. At Flensburg, plant for producing carburetted water gas has been erected and is working satisfactorily. At Elsinore, it is expected that there will be a great increase in the consumption of gas in the current year, as a new part of the town is being laid out for building purposes. Arrangements have been made with most of the town authorities for the Company to supply gas through prepayment meters. The sale of gas-stoves on deferred payment has been introduced, and show-rooms are being arranged. All necessary alterations and repairs at the works are in progress; and the whole of the stations will be in good working order for the ensuing winter.

Cardiff's Water Supply.—At the last meeting of the Water Committee of the Cardiff Corporation, some interesting figures were given by the Water Engineer (Mr. C. H. Priestley) regarding the water supply. He said the average week-day consumption was 5,685,000 gallons, equal to 27·06 gallons per head; and the average Sunday consumption 4,346,000 gallons, or 20·69 gallons per head. The consumption for trade and municipal purposes, including all water sold by meter, has gradually increased, the figures for the past three years being as follows: In 1902, 659 million gallons; in 1903, 715 millions; and in 1904, 792 millions. During the past quarter, the total quantity of water sold by meter was 212,491,000 gallons. Mr. Priestley said the increase in the water supplied by meter was to be accounted for by the fact that the consumption of the tramways and electric undertakings had gone up; the greatest increase being at the Great Western Railway, as the Company took the whole of their supply from the Corporation.

MANCHESTER CORPORATION GAS SUPPLY.

Starting the New Retort-House at the Gaythorn Station.

In the account which appeared in the "JOURNAL" for the 18th of October last year of the visit of the Manchester Corporation to their various gas-works, it was mentioned, in connection with the Gaythorn station, that a new retort-house, to be equipped with inclined retorts, was in course of erection in place of one which had been in use for 43 years; and a view of it was given. The first half of the installation has lately been completed; and last Friday it was brought into use by Alderman J. Bowes, the Chairman of the Gas Sub-Committee who have control of the station, charging the first retort. The operation was witnessed by the Lord Mayor (Sir T. Thornhill Shann), the Chairman of the Gas Committee (Alderman Gibson), the Chief Engineer (Mr. J. Gibson Newbigging, Assoc.M.Inst.C.E.), the Superintendent (Mr. Charles Nickson), the Manager of the station (Mr. John Merrill), and members of the Gas Committee, as well as several officials.

At the conclusion of the ceremony, luncheon was partaken of in the Town Hall—Alderman Gibson presiding. After the repast, Alderman Bowes gave an account of what had been done at the Gaythorn station during the past few years. He said No. 1 retort-house had been reconstructed and fitted up with inclined retorts equal to a production of $1\frac{3}{4}$ million cubic feet of gas per day; and that morning the Committee had set to work the first section of the reconstructed No. 2 house, which was capable of making $4\frac{1}{2}$ million cubic feet daily. The old retort-house, which the new one when completed would replace, was of a capacity of $2\frac{3}{4}$ million cubic feet per day. There would therefore be an increase of 60 per cent. in the producing power on the same area. He had it on the authority of the Chief Engineer that the cost of carbonizing would be reduced about one-half, and there would be other savings, such as the consumption of fuel for heating the retorts, and also (which was not less important) that the cost of the work had not exceeded the estimate. At the same time, the labour of the men in working the retorts would be considerably lightened. Another matter to be noted was an improvement in the appliances for collecting and disposing of the coke. It was no uncommon thing to have upwards of 800 customers for coke in a single day. The arrangements were now so good that twelve carts could be filled with 2 tons of coke in the space of 90 seconds. Alderman Bowes concluded by proposing the health of the Chairman of the Gas Committee.

In acknowledging the toast, Alderman Gibson said the Gaythorn station was the oldest in Manchester. Established in 1825 by a Company for making what was then called "portable" gas, which was transported from the works to warehouses and other premises where it was wanted, it did not prove a great success; and in 1831 it was sold to Mr. James Fernley for £5650. Six or seven years later, it was sold to the Police Commissioners, who then conducted the town's affairs, for £16,000; and in 1838 it was passed over by them to the Corporation. Since then the gas undertaking had enormously increased, and had been guided by the efforts of a number of very competent people. More than £400,000 had been spent at Gaythorn; and the land, buildings, and plant there now stood as an asset in the books of the Gas Department at £276,000. The new installation of inclined retorts had cost between £35,000 and £36,000, or some £6000 less than the original estimate.

The health of the Lord Mayor having been cordially drunk, his Lordship, in reply, humorously remarked that, as these new works would effect such a great saving in expense and labour, he looked forward to the time when there would be a great easement of the rates, which the Gas Committee had helped very much in the past. If it did more in the future, and if the Electricity and Tramways Departments did well also, it seemed that the time was coming when Manchester would have no rates at all, and when people all round would flock to its fold, and London would be nowhere.

The other toast was "The Contractors," to which Mr. Dempster (of Messrs. R. & J. Dempster) and Mr. George Winstanley (of the Winstanley Speciality Company) responded.

Defraying the Cost of the Recent Royal Visit.

When the minutes of the Gas Committee came up for confirmation at last Wednesday's meeting of the Manchester City Council, the Chairman of the Committee, Alderman Gibson—who was heartily welcomed on his return to the Council after his recent illness—asked that a letter from the Lord Mayor (Sir T. T. Shann) to him, and his reply thereto, might be read. Accordingly, the Town Clerk read the letters. The Lord Mayor suggested the propriety of the Gas Committee paying, out of their reserve fund, the costs incurred in connection with the visit of their Majesties the King and Queen; the amount being £8893. Alderman Gibson, in his reply, observed that the Gas Committee could not accede voluntarily to the request; but if the Council declared a wish that the Committee should take this responsibility, they would bow to the decision. The Lord Mayor then moved, and Alderman Thompson seconded, a resolution calling upon the Gas Committee to pay the bill. The Lord Mayor said the Gas Department was in a prosperous condition, and could in the future make up the call out of profits; and by meeting the wishes of the Council, the necessity of adding to the general estimates and increasing the rates would be avoided. Mr. Plummer protested against the proposal, as undignified and mistaken; but the resolution was carried by 43 votes against 33.

Price of Gas to Manufacturers in Birmingham.—At a meeting of the Birmingham Corporation Gas Committee, the Sub-Committee appointed to consider the question of the price of gas for power purposes, presented an interim report, stating that the Secretary of the Department (Mr. G. Hampton Barber) had furnished them with a large volume of information on the subject, which was being considered. At present the Sub-Committee were unable to express a report embodying any definite opinions; but they hoped to be able to do so in time for a report to be presented on the matter to the next meeting of the full Committee.

CROYDON COUNTY COUNCIL AND ELECTRICITY.

Electric Arc Lighting to be Extended.

The Croydon County Council concluded, at their meeting on Monday last week—the MAYOR (Alderman Allen, J.P., in the chair)—the discussion of the question of the cost of electricity and gas for public lighting, to which reference has been made in previous issues of the "JOURNAL." (See Sept. 26, p. 827, and Oct. 17, p. 184).

The Lighting and Electricity Committee submitted a report in the course of which it was stated that a petition had been presented from residents in Penge Road, South Norwood, requesting that, in connection with the tramway extensions through that road, electric arc lamps should be provided. The Committee pointed out that the Council had already adopted this form of lighting for the road in question, at an estimated cost of £417; and they said they would provide a main in connection with the tramway feeder, and, by reason of the cables for the electric light being laid at the same time as the tramway cables, the estimated cost was reduced to £220. The Committee further stated that they had had before them, in connection with the construction of the tramways authorized by the Acts of 1902-3, a report from the Borough Electrical Engineer for lighting the whole of the tramway track along Mitcham Road by means of 32 magazine flame arc lamps, at an estimated cost of £882—a considerable saving on the cost being effected by this work being carried out simultaneously with the construction of the tramways. This extension, would, it was said, overcome a difficulty which had arisen to prevent the Borough Hospital being lighted by electricity, and would also make provision for further supply in the neighbourhood which would shortly be required. The Committee recommended—"That the tramways route be lighted by electric arc lamps as suggested; that the works be carried out simultaneously with the tramway construction; and that the cost be charged against the loan of £20,000 already sanctioned by the Local Government Board for the extension of electric mains."

Alderman MILLER (the Chairman of the Committee), in moving the adoption of the report, said that some two or three years ago the Council agreed that when the tramway was laid it should be lighted by arc lamps. This resolution it was now proposed to carry out. Arc lamps had already been tried in the borough, and he thought no one had complained of the sufficiency of light. There was, however, the question of economy, which had been forced upon them by the Gas Company. They had been told they should try gas so as to save very much money. He might tell the Council that the cost of the lamp proposed would be £12 10s. per annum. He had recently been to London to see the high-pressure lamps which had been put up there, and for which £15 per lamp per annum was charged. He went with an unbiassed mind, and he admitted that if they put up their gas-lamps at Croydon as had been done in London—viz., 20 yards apart—they would have a very efficient light. But they would have to pay £15 per lamp; and therefore he would ask where the economy came in. When he last spoke in the Council on this subject, he said that gas-lamps threw the light on to the pavement. He held the same view now; and he thought he must have made out a good case, for the gas papers had made some strong remarks upon him. He, however, had taken very calmly the hitting they had given him, because he was sure they would not have attacked him personally in the way they had done if he had not made out a case. No doubt the Council and the Croydon public, who had probably read the remarks, would take the same view. What he had said was that they wanted a good light in most of their streets; and they wanted the light thrown outwards, backwards, and forwards.

Alderman MORLAND pointed out that the real question was the cost of lighting Mitcham Road. What would be the estimate of the cost?

Alderman MILLER: I do not think I can tell you; but I believe it will be about £400.

Mr. ROGERS seconded the motion.

Alderman LILLICO said the matter ought not to be rushed through. The Council should have some experience of the new lighting. He moved, as an amendment, that the paragraph in the report relating to the lighting of Mitcham Road be referred back, in view of the fact that there was to be a reply that night by Mr. Price on the subject.

Alderman FOSS seconded the amendment.

Mr. PRICE said he wished to support the amendment. It had been said that he had brought forward his motion in the interests of the Gas Company. This was not so, as he had no interest whatever in it. He looked upon electric arc lamps as the most extravagant mode of lighting; and he gave figures some time ago in support of his opinion. He might refer to the case of Liverpool, which, although owning the electric light undertaking, lighted the streets largely with incandescent gas-lamps. He did not get his information from either the gas or the electric light concerns, but from the report for the year 1904 of the City Lighting Engineer. This official stated, in regard to incandescent gas-lamps, that the Lighting Committee had fixed 3 double and 96 single incandescent lamps during the year, at a cost of £156 7s. 4d.—increasing the annual charges by £16 8s. With regard to the lighting of new streets, he said that it had been carried out over five miles of roadway, by the erection of 5 double and 60 single incandescent burners and one ordinary burner. At the end of the year there were $441\frac{1}{4}$ miles of streets, of which $4\frac{1}{2}$ miles were lighted by electricity, $426\frac{1}{4}$ miles by incandescent gas-lamps, and the remaining $10\frac{1}{2}$ miles (principally back streets) by the ordinary system. So that the Council would see that in Liverpool they lighted only $4\frac{1}{2}$ miles of streets by electricity; and that city was four or five times larger than Croydon. Now let them take the case of Hull, which was a very large place, and a great deal of it was lighted by incandescent gas-lamps. He had a letter from the City Engineer in which he stated that, though the Corporation owned the electricity works, they arranged with the Gas Company to light most of the streets. After referring to the number of lights, he said there were 21 small lamps, 311 five-cluster and 335 three-cluster incandescent lamps, and 480 single burners, which he (Mr. Price) believed were incandescent. The City Engineer concluded by saying

that he did not think it was likely there would be any important extension of street lighting by arc lamps. At Hull and at Liverpool, therefore, the state of things was practically the same—only a very small number of the principal streets were lighted by electricity. He would now refer to London. He thought that for a very considerable time the Corporation had lighted the streets with incandescent lamps; and for the new thoroughfares, Aldwych and Kingsway, they had adopted incandescent gas lighting. In conclusion, he would just repeat the figures he mentioned some time ago. The cost of lighting in Croydon in 1894 was less than £7000; the rate being 3d. In 1904, it was £14,000, and the rate was 4¾d. Lighting 127 miles of streets by gas cost in 1904 something like £7062; while the arc lamps in 14½ miles of streets cost £7212.

Mr. BETTERIDGE expressed the hope that the Council would not refer the report back, and defer the proposal to extend their cables, and put up lamps costing £12 10s. against £17 paid at present, and so well light Mitcham Road, which was a main thoroughfare.

Alderman MORLAND said the question the Council had to decide was whether Mitcham Road should or should not be lighted by electricity. They were told that the cost would be something like £400, against about £200 for gas. What they had to consider was whether the road was a sufficiently main thoroughfare to warrant them spending £400 upon its lighting. He thought the matter might be left for a few years, when the road would become more a main thoroughfare.

Mr. STRANKS remarked that, so far as Mitcham Road was concerned, surely the fact that the Council required tramlines to be laid in it showed that it was an important thoroughfare; and it was hoped and expected that it would become more so in the near future.

Alderman Sir F. EDRIDGE said that if the Council could put up the lights proposed at £12 each, it would be an enormous saving to the whole borough; and he thought that if the discussion resulted in the adoption of the report, some of the Council would be very pleased to see the scheme carried into effect.

Mr. MOORE characterized the proposal as an astute manœuvre on the part of the Chairman of the Lighting and Electricity Committee to get the lighting of a piece of road before Mr. Price replied on his motion. He thought it was not quite fair to Mr. Price that they should prejudge the case of Gas *v.* Electricity in regard to a long piece of road like Mitcham Road. He therefore hoped the Council would defer the paragraph relating to it in the report.

Alderman MILLER objected to the suggestion that the proposal before the Council was an astute manœuvre on his part. It was absolutely untrue, because he had no such intention in his mind, as he had explained. What he had done was solely with the view of saving money. He hoped the Council would not refer the paragraph back. He would not have brought it up had it not been a matter of necessity; and if the Council decided to refer it back, the responsibility would rest with them.

A vote was then taken on the amendment, with the result that it was lost by 25 to 15.

The MAYOR called upon Mr. Price to reply to the discussion on his motion, the text of which was given in the "JOURNAL" for the 17th inst.

Mr. PRICE said he thought the principle of extending the arc lamps had already been adopted by the Council, and therefore he did not propose to take up their time by making any reply whatever.

The MAYOR then put the motion, and it was declared lost.

THE SULPHUR QUESTION IN WANDSWORTH.

The Borough Council Agree to Relax the Existing Provision.

At the Meeting of the Wandsworth Borough Council last Wednesday, the General Purposes Committee reported that they had considered a letter from the Secretary of the Wandsworth and Putney Gas Company on the subject of the provision contained in the Company's Act of 1900 which regulates the proportion of bisulphide of carbon in the gas. He stated that the provision in question had given the officials continued anxiety and trouble, and had put the Company to much capital outlay; while at the same time it was attended with considerable risk of nuisance to people living close to the works. He pointed out that similar legislation, of thirty years' standing, for the three large Metropolitan Gas Companies surrounding the Wandsworth Company's district—two of them supplying gas within the borough—had from the 30th ult. been abrogated by an Act obtained by the London County Council last session, in consequence of a report made to the Board of Trade by a Departmental Committee. Under these circumstances, he submitted that the legislation which the Company accepted in 1900 was unnecessary, uncalled for, and inexpedient; that the extra cost to the Company was of less consideration than the anxiety and risk involved; that a small saving of perhaps ¼d. per 1000 cubic feet of gas would accrue by dispensing with lime purification; and that, as the Directors were anxious to make a reduction in the price of gas, and this question was to some extent standing in the way, they would be glad if the Council would see how far they could follow the course taken by the London County Council and dispense with penalizing for the small extra fraction of sulphur that would remain in the gas by the disuse of lime purification, pending the Company obtaining the authority of Parliament to secure similar relief to that which had been given to the other Gas Companies. As it would be desirable to make a reduction in the price of gas at Christmas next, and the lowest that could possibly be made (1d. per 1000 cubic feet) would amount to a saving to the consumers of more than £2000, the Directors asked for an early consideration of the question. The Committee further reported that they had had before them a report on the matter from the Council's Gas Examiner, and they had decided to recommend that no action be taken. On the motion for the adoption of the report and recommendation, an amendment was moved that the Company be allowed the same facilities as the other Gas Companies in the district; and, after some discussion, this was carried.

PUBLIC LIGHTING OF NEWCASTLE.

An Offer by the Gas Company.

As was briefly stated in the "JOURNAL" last week, a letter has been addressed by Mr. Thomas Waddom, the Secretary of the Newcastle-upon-Tyne and Gateshead Gas Company, to the City Lighting Committee, in reply to an inquiry whether, in view of the proposed lighting of certain streets by electricity, the Company had any amended offer to make. Mr. Waddom said he was instructed by his Directors to make the following offer.

The Company will provide and erect free of cost to the Corporation, in the several streets named in the report of the Watch Committee, 206 pillar-lamps with shadowless lanterns and self-intensifying burners of 300-candle power each, similar to those now erected in Grey Street, Shields Road, Westmorland Street, and elsewhere in the city. The lamps would, as usual, remain the property of the Company. Provide and fix in each lamp an improved automatic and instantaneous lighting and extinguishing apparatus; the cost of the same to be repaid to the Company by six annual payments of 5s. 7d. per lamp. The apparatus would become the property of the Corporation. Supply gas for the burners at the rate of 10 cubic feet per lamp per hour, and gas for the bye-passes, at the price per 1000 cubic feet and discounts current for the time being for street lighting in the city. Maintain and clean the lamps, and regulate, set, and maintain the lighting and extinguishing apparatus for the fixed and inclusive charge of 16s. 10d. per lamp per annum.

The annual cost of a lamp lighted and extinguished at the same hours as the electric arc lamps ($2793\frac{22}{60}$ hours per annum), would, upon the above conditions, with gas at the present rate of 2s. per 1000 cubic feet, be as follows:—

	£	s.	d.
Gas for burner (£2 0s. 6d.) and bye-pass (2s. 7d.)	2	3	1
Maintenance	0	16	10
Annual cost for gas and maintenance	2	19	11
Redemption of automatic lighting apparatus. (To be charged during the first six years only.)	0	5	7
	3	5	6

Conditional upon the above-mentioned 206 lamps (or such other number as may be mutually agreed upon) being fixed, the Company would, upon the same terms, provide automatic lighting apparatus for the whole of the self-intensifying lamps at present erected, or hereafter to be erected, in the city, and would maintain such lamps at the following fixed and inclusive rates:—

23-feet lamps	16s.	10d.	per annum.
10 do.	16	10	do.
5 do.	15	2	do.

These rates being 2s. 1d. per lamp less than the present cost of maintenance, and there being 855 self-intensifying lamps now erected, or on order, the immediate saving to the Corporation would, therefore, be £89 1s. 3d. per annum, with a prospective saving of 2s. 1d. for each lamp erected after this date, exclusive of the above 206.

The following is a comparison of the annual costs of the respective proposals of the Tramways Committee and the Gas Company:—

Electric Arc Lamps.

	£	s.	d.
180 lamps at £11	1980	0	0
Less saving of £3 18s. each upon 200 existing lamps	780	0	0
	1200	0	0

Self-Intensifying Gas-Lamps.

	£	s.	d.	£	s.	d.
206 lamps at £3 5s. 6d.	674	13	0			
Less saving of 2s. 1d. each upon 855 existing or ordered lamps	89	1	3	585	11	9
Annual saving by adoption of gas-lamps				614	8	3

The automatic lighting apparatus proposed to be fixed are an improvement upon those in Jesmond Road and neighbourhood, inasmuch as they have been altered so as to light up instantly at the appointed time, instead of taking some 10 minutes to reach the maximum light. They could be easily arranged to extinguish alternate lamps at midnight, as in the case of the electric lamps; and if it were decided to keep any of the 206 lamps burning all night, the only addition to the cost would be 14s. 2d. per lamp for the gas.

The Watch Committee state in their report that the streets in question would be efficiently lighted by the provision of 206 self-intensifying lamps. This is perfectly true, for, notwithstanding there being a larger *initial* candle power claimed for the arc light, it is obvious that the position and greater height of the arc lamp—24 ft. 3 in. in the centre of the road—as compared with the 10 ft. 9 in. of the gas-lamp on the footpath, places the former at a great disadvantage as regards the effective lighting of the footpaths, which are, of course, where the light is most required. This fact is now being realized in the City of London and other places, where gas-lamps have taken the place of electric arc lamps; and I respectfully submit that those streets of this city lighted by means of self-intensifying gas-lamps are as effectively lighted as those lighted by means of electric arc lamps, and at from one-third to one-fourth the cost.

If more light than is proposed to be given were really necessary—which I do not think it is—it could be obtained by increasing the number of 300-candle power lamps by placing them closer together, or else by adopting 600-candle power lamps, the annual cost of which would be £5 6s. 1d. for $2793\frac{22}{60}$ hours. The only difference between them and the 300-candle power lamps being the cost of the gas (£2 0s. 7d.); and at £5 6s. 1d. they would be less than half the cost of electric arcs at £11, and give a much better light on the footpaths—probably these larger lamps would be useful at important street crossings.

THE WORK OF THE NOTTINGHAM GAS DEPARTMENT.

Committee Chairman's Election Speech.

In the course of an address last Tuesday to the electors of the Broxtowe Ward, Mr. Edward Harlow, who is seeking re-election to the Nottingham City Council, devoted a considerable amount of attention to gas matters. The chair was taken by Mr. Pendleton, who remarked that the gas was better now than it was when Mr. Harlow became Chairman of the Committee (about a year ago)—every man and woman in the city knew that. Some time since the gas undertaking was in a very unsatisfactory state; and it was only when Alderman Radford called attention to the subject in the Council that the whole city realized that a strong man was wanted in the chair. This strong man was found in the person of Mr. Harlow.

Mr. Harlow said no business could be carried on satisfactorily unless it was, first of all, well planned. Some of the Nottingham works were thirty years old; and no amount of improvement would make them modern works. They were to some extent handicapped by obsolete plant. It had been the object of the Committee to bring it up to date, and make it as good as possible. He trusted also that the management was improving; and that as time went on, it would become perfect. If they were to get full value out of the work, it was the duty of every department to secure the loyalty of the workmen by treating them properly and generously. He was forced to admit that the conditions of employment in the gas-works were not ideal. It was a disagreeable trade; and men working in a disagreeable trade ought to be paid better than for more pleasant labour. So far as it was possible, the Committee recognized this fact; and personally he was prepared to do his best to make conditions as pleasant as possible under the circumstances. He would go further, and say that the Corporation ought to be a model employer of labour, and that the men should be treated, not merely with justice, but with generosity. A resolution had been sent to him by the Gas-Workers' Union supporting his candidature, and calling upon all Trade Unionists to do likewise; and he acknowledged the tribute in appreciative terms. Mr. Harlow then went on to say that he did not neglect the consumers' aspect of the gas question. He held that the service should be good, and it should also be cheap. Those were the general principles on which he had been trying to work.

At the conclusion of the address, a number of questions were put to Mr. Harlow. "Are you in favour of still further reducing the illuminating power of the gas?" asked one ratepayer. "I am sorry to say," was the reply, "that what I said to the deputation from the Chamber of Commerce was misrepresented. What I said was that the general tendency of the times was for the illuminating power of gas to be reduced rather than increased. I based that statement on actual knowledge. In Nottingham at the present time the gas is 16-candle power; and twelve months ago we were only getting 14-candle power. There is not the slightest intention on the part of anyone connected with the gas undertaking to make any further reduction. It will not be interfered with one way or the other."

PRICE OF GAS FOR LIGHTING AT ROCHDALE.

A decision was come to last week by the Rochdale County Borough Council on the much debated question of the price of gas for lighting purposes, by agreeing to a reduction from 2s. 10d. to 2s. 8d. per 1000 cubic feet. An amendment, that the amount of the reduction should be 3d. (as was, it will be remembered, recommended by the Gas Committee in July), was lost by an overwhelming majority.

When the question of re-adjusting prices first arose, in the early part of the year, the Engineer and Manager (Mr. T. Banbury Ball) prepared a report for the guidance of the Committee, who desired to be informed upon "the incidence of the charges for gas on the various classes of consumers." In preparing this document, Mr. Ball thought it would probably be more advantageous, and attain the object in view, if he dealt, on general lines, with the influence of each class of consumption on the cost of producing gas. For this purpose, he grouped the charges under three heads: (1) Costs of manufacture—coal, wages, purification, wear and tear, &c. (2) Costs of distribution—maintenance of mains and services, inspection, collection, and rates and taxes. (3) Interest and sinking fund charges.

The items comprised under the heading of manufacture, Mr. Ball said, were not affected by the class of consumer, but remained the same for all. During the past year, they amounted to 10·1d. per 1000 cubic feet of gas made. With regard to distribution, these charges did not vary very much as between the large consumer and the small one. The same number of visits had to be paid, the same amount of book-keeping was involved, and the maintenance of mains and services was not much greater in the one case than in the other. If the total outlay incurred under this heading last year were divided by the number of meters in use, the result would be a charge of 6s. 6d. per customer per annum. Reckoned at per 1000 cubic feet of gas consumed, there is, of course, a great difference in the proportion. If a consumer burnt only 10,000 feet of gas a year, the 6s. 6d. would represent 7·8d. per 1000 feet; whereas if he took 100,000 feet, it would represent only 0·78d. per 1000 feet, and so on. As to the third heading, interest and sinking fund charges amounted last year to £9264; there having been no payment made to the reserve fund for this period. The amount named was equal to 4·21d. per 1000 cubic feet made, and, of course, embraced all classes of consumers. But the charge must vary considerably as between one customer and another, depending upon the amount of plant provided to meet the needs of each, and upon the length of time during which that plant was usefully employed. The ideal customer would be one who took a regular supply for all the 24 hours of every day, as, in his case, storage accommodation would be unnecessary, while outlay on plant would be reduced to the minimum, and its earning capacity raised to the maximum. There were, however, few, if any, such customers, in their district at any rate; and the nearest approach to it were those users of gas-engines whose demand was regular for ten hours per day, or (say) 56 hours per week. Much less satisfactory was the consumer—the millowner, for instance—who burnt a large quantity of gas in a very short time, and required it for only a few hours per day in the winter months. Regarding the consumer who used gas regularly 56 hours per week as a standard of comparison, and representing him as 100, then the value of consumers like the millowners would be represented by 38, and the general average of the whole body of consumers by 55. This was arrived at by taking the maximum demand for one day and multiplying it by 365, so as to get the quantity which the plant capable of meeting this demand would produce in a year. The amount consumed by the different classes, of course, represented a percentage of this figure. The charge of 4·21d. per 1000 cubic feet last year for interest and sinking fund, taken on the average of all the consumers, was represented by the figure 55; and therefore this item would be reduced to 2d. in the case of the power consumer whose corresponding figure was 100, and increased to 6d. for the mill consumer whose figure was 38 only.

On this basis a consumer for power purposes, if supplied with 100,000 cubic feet of gas a year, at cost price, would get it for about 1s. 1d. per 1000; while the millowner, with a similar consumption, would be supplied at a cost of about 1s. 5d. per 1000. Coming to very small consumers, of (say) 4000 feet a year, the cost in their case would be 3s. per 1000. Of course, the figures for ordinary consumers burning more than this amount for lighting would be more favourable. These conclusions were arrived at by taking the same manufacturing cost in each case (10·1d. per 1000 feet) and the same distribution cost (6s. 6d. per consumer); but the interest and sinking fund charges were, of course, as already mentioned, less in the case of the power-gas consumer than the two others. From these cases, Mr. Ball remarked, it would be easy to see which class of consumers was entitled to gas at the lowest price.

He concluded by submitting a revised scale of charges for power purposes, involving a reduction of revenue of £1600; and this was agreed to by the Council. But, as stated above, a proposal to lower the price for lighting purposes at that time fell through.

THE GAS EXHIBITION AT NEWPORT (MON.).

The exhibition of modern gas appliances, held under the auspices of the Newport (Mon.) Gas Company, in the Tredegar Hall of that town from the 18th to the 28th inst.—a notice of which appeared in our issue of last week—has been in every sense an unqualified success. Its popularity has been attested by the daily crowded attendances; and a better tribute to its efficiency could scarcely be found than that which has been furnished by the Corporation Electricity Committee, who, while the exhibition was in progress, announced their decision to recommend an all-round reduction in their prices for current, and also their purpose to hold an exhibition on their own account at an early date. There has been a large attendance at the exhibition of gas managers and officials from all parts of South Wales and adjacent districts, who have all highly praised the magnificent display.

Commercially considered, the success of the exhibition is endorsed by every exhibitor; many of the stands having disposed of their goods several times over, in addition to having received innumerable inquiries with a view to future business. The cookery demonstrations by Miss Bruce were, throughout, largely attended; and the cookery competitions for girls from the local Council Schools were an exceedingly popular feature. A home-baking competition, open to users of gas-stoves, also received many entries, and aroused much interest.

A lecture on the "History, Manufacture, and Modern Applications of Gas," by Alderman Thomas Canning, Engineer and Manager of the Gas Company, held in the Town Hall Assembly Room on Wednesday evening last, was favoured with the usual crowded attendance, and was followed throughout with great interest.

The exhibition was admirably organised on behalf of the Gas Company by Mr. P. H. Hazell (Secretary), and Mr. Canning (Engineer), with whom was associated Mr. W. R. Francis.

The Effect of the Exhibition.

"An important step in municipal trading was taken at Newport on Tuesday," said the "Western Mail" next day. "The Electricity Committee of the Corporation, probably alarmed at the great strides which gas is making in the town, and particularly as the outcome of the excellent exhibition which the Gas Company is running in the town, decided to make a series of sweeping reductions in the prices of electricity for lighting, heating, and cooking purposes. The price for lighting is to be reduced 1½d. per unit—that is to say, from a maximum of 5½d. to 4d., and a minimum of 3d. per unit. There is also to be a reduction in the supply of current for heating and cooking. Further than this, the Committee decided to promote a large exhibition of electrical appliances. The advocates of municipal trading see in this step a considerable advance against private enterprise; and those who take the opposite view are loud in their protestations that, whereas the Gas Company are a private trading concern and have to pay the expense of their own exhibition and their own canvassing for business, the Corporation may dip into the rates to promote a species of trade in opposition to the Gas Company of the town."

Sales of Stock and Shares.—At the London Hotel, Taunton, last Tuesday, Mr. Howard Maynard, sold £3500 of new ordinary stock of the Taunton Gas Company, ranking for a standard dividend of 7 per cent. per annum, subject to the sliding-scale. It was put up in 53 lots; and the total amount realized was £4981 5s., or an average of £148 5s. per £100 of stock. At a sale conducted by Messrs. Sparks last week, 400 £5 shares in the Littlehampton Gas Company (a new issue) were disposed of at prices ranging from £8 1s. to £8 10s. each. The last dividend paid on the Company's ordinary shares was at the rate of 8½ per cent.

PUBLIC LIGHTING OF EXETER.

Electricity v. Gas.

A report on the general question of the public lighting of Exeter has just been presented to the City Council by the Surveyor and the Electrical Engineer. It shows that the present annual cost of gas lighting is £4210, and of electric lighting £860. To substitute electric light for gas throughout the whole area of the city would necessitate the laying of at least one cable in 27¾ miles of streets, and the fitting and connecting up to 1214 lamps. The capital outlay for this conversion would be £10,381; and the total cost per annum £4831. In laying mains in new streets it would be policy to lay them of sufficient size to deal with the general supply of the particular street, which meant a further capital outlay of £6050, and an additional annual charge of £310. The annual cost of lighting the 13 miles of streets in which cables are laid is £1420; and if 390 incandescent electric lamps were substituted for the 395 gas-lamps now in use, the cost would be £1465, in addition to which £146 a year for ten years would have to be provided for fitting up the new system. The officials report, however, that the conversion of the existing gas-lamps without any provision for additional ones, would be very unsatisfactory. They recommend (1) that in the streets through which the tramlines are laid—excepting those already lighted by electricity—arc lamps should be suspended from the tramway poles and fixed to every alternate pole; (2) that in Queen Street and the main street from St. Anne's Chapel to the St. Thomas side of the bridge, the new golden flame arc lamps be fixed to existing columns—28 lamps being substituted for the existing 37; and that the remaining length of streets be lighted by incandescent electric lamps, spaced about 55 yards apart. The officials also submit another estimate setting out the cost of converting the 300 or 400 gas-lamps into incandescent electric lamps, and the expenditure which will be necessary to provide and fix 45 new arc lamps, 28 of them being golden flame lamps for the principal streets. The total net amount is £2000, and the annual maintenance (exclusive of a yearly repayment of one-tenth of the capital outlay) is set down at £3264. This represents an additional cost in respect of the 13 miles of streets of 43 per cent.; but the increased candle power over this area would amount to 235 per cent. The officials remark that to obtain an equal effective candle power with incandescent gas-lamps would, on any system they were acquainted with, cost at least £4000 per annum.

The report was submitted to a joint conference of the Electric Lighting Committee and the Committee who had charge of the public lighting, with the result that a Special Committee was appointed, with instructions to request the Gas Company to submit a scheme for lighting the streets other than those through which the tramways run, with an estimate of the cost and the candle power to be obtained. When the matter came before the Council, Mr. Gadd suggested that the Gas Company should be asked to submit a scheme for lighting the streets along the tramway route as well as the other parts of the city. The Mayor (Mr. Perry) said the Council had already passed a resolution to light by electricity the streets along which the tramways were laid. Mr. Gadd pointed out that there was great improvement in gas lighting; and he said the Council ought to consider what they were doing, and not commit themselves. Mr. Ross expressed the hope that there would be fewer standards in the streets when any alteration was carried out. The existing standards for the electric light were too high, and might be lowered with distinct advantage. With regard to the comparative cost of lighting, he doubted the statement in the report that electricity would cost only £3264 and gas £4000. In London, the new thoroughfares of Kingsway and Aldwych were being lighted with gas; and in the City they were discarding the electric light for gas, not only on account of its increased brilliancy, but on the ground of its cheapness. A suggestion that the number of members of the Committee on the subject should be increased was referred to the Lighting and Electricity Committees. Mr. Varwell gave notice to move that the decision to light the streets along the tramway route by electricity be rescinded.

SUPPLY OF ELECTRICAL ENERGY IN LONDON.

The County Council to Promote a Bill.

At the Meeting of the London County Council to-day, the Highways Committee will present a long report on the subject of the supply of electrical energy in London.

The Committee direct the attention of the Council to the very important issues which have been raised in connection with the introduction into Parliament last session of several Bills dealing on a much larger scale than any hitherto brought forward with the supply of electrical energy in London and certain adjacent districts. The most comprehensive of these schemes—that promoted by the Administrative County of London and District Electric Power Company—contemplated the supply of energy, both in bulk and also to large retail consumers, over an area of upwards of 500 square miles. The basis of this scheme was that the Company should, by agreement, or failing this by competition with the consent of the Board of Trade, eventually become suppliers of electrical energy in bulk to all the Local Authorities and Companies supplying in London, and in a large area outside London, or else absorb the existing undertakings and carry on the whole service. In the event of the existing supplying authorities not being absorbed, they would "scrap" their generating stations and become retailers or distributors of the energy sold to them in bulk or wholesale by the Administrative Company.

The Committee point out that at the present time about half London is supplied with electrical energy by Local Authorities' undertakings, each confined to a single borough; and the other half is supplied by Companies whose undertakings are, with but a few minor exceptions,

CARBURETTED WATER-GAS APPARATUS

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	LEICESTER	2,000,000	SMETHWICK	500,000
BELLEVILLE	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Fourth Contract)	1,000,000
		ACCRINGTON	500,000	MONTREAL, ONT. (2nd Cont.	1,800,000
				HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 8,150,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

compulsorily purchasable by Borough Councils in 1931. This right of purchase, which is a cardinal feature of the Electric Lighting Acts of 1882 and 1888, still exists; but the Committee say, its value and practicability have become seriously jeopardized by the character which the Companies' undertakings have assumed. Inasmuch as a single Company's undertaking often extends through several boroughs, while there is only one generating station, many of the Local Authorities will, if present circumstances continue, only be able to buy mains and no station, while others will only be able to buy mains and a station far too large for the needs of a single borough. In some cases, moreover, the stations are outside the areas of supply, and, it is contended, not purchasable at all. The Committee have frequently drawn attention to these difficulties when schemes much more restricted in character and extent have been put forward. The scheme of the Administrative Company, however, raises these issues in a far more acute form. Had the Bill become law, an enormous monopoly would have been created in the supply of what is now one of the most important and vital factors in the commercial development of London and the neighbouring districts.

The Committee consider that what is wanted at this juncture in the history of the electricity question is that a complete view of the case should be stated by an authority capable of putting it before Parliament. They have not gone fully into the details of a definite scheme; but they believe it will be quite practicable to bring forward a satisfactory one, bearing in mind the importance of providing cheap electrical energy for general use in London, and at the same time securing continuity of the policy of public control which was intended to be ensured by the purchase clauses of the Electric Lighting Acts of 1882 and 1888. It is proposed to hold a conference with representatives of London Local Authorities on Monday, the 20th prox., when the Committee will place their proposals, in the event of their adoption by the Council, before them. The Committee believe the Council will think it right to seek parliamentary power to enable them to supply electrical energy; and they therefore recommend—"That authority be sought in the session of Parliament of 1906 (1) to enable the Council to supply electrical energy in London and certain surrounding districts on the lines indicated in the report of Committee; (2) to confer upon the Council power to carry out any necessary works, including the erection of buildings, the laying of mains, &c., necessary to give effect to such powers; (3) to empower the Council to make arrangements with Local Authorities and others having power to supply electrical energy, and to enter into agreements to give effect thereto; and (4) to confer upon the Council any general powers which may be necessary to enable it effectively to supply electrical energy."

Incandescent Gas Lighting in Marylebone.—On Tuesday, the Finance Committee of the Marylebone Borough Council reported that they had passed an estimate of £3000 for completing the installation of incandescent gas lighting in the streets of the borough, excluding Oxford Street, which it is proposed to deal with later on.

SCARCITY OF WATER IN THE PROVINCES.

The absence for some weeks of any heavy fall of rain has brought about a very critical state of affairs at Leicester. For many months the water supply has been restricted, and at present it is cut off for ten hours out of the 24. But even with a reduced consumption of 2 million gallons per day, the reserve continues to diminish. The present rate of consumption is about 3¼ million gallons daily, which is equal to a decline from 21 gallons to about 13 gallons per head per day, on a population of 266,000 persons. Deep wells are being sunk, so as to raise further auxiliary supplies; and some 300,000 gallons per day are obtained from a colliery shaft. It had been confidently expected that about a million gallons per day would be obtained from new works at Loughborough; but, owing to a delay in completing the work, and the prevailing shortage of water, this quantity cannot be spared. The Derwent Valley scheme, in which Leicester will participate, cannot be available for six years at least, and unless there is a heavy rainfall soon, it is feared that the supplies for manufacturing purposes will have to be curtailed. It is not in the Midlands only that the effect of the dry weather is being felt. Bargoed, in the Rhymney Valley, is again suffering from a water famine, and was recently practically without water for four days. On Sunday, the 22nd inst., a great throng of people visited the provisional supplies provided by the Gelligaer District Council. At a meeting of the Bedwellty District Council at New Tredegar next day, Mr. Morgan Thomas asked whether something could not be done to give Aberbargoed an adequate water supply; and the Clerk said the Gelligaer Council were going to apply to the Merthyr Council for help. It was decided to ask the Tredegar Council to allow a supply for three to four hours per day; and in the meantime to draw the attention of the Rhymney and Aber Valleys Gas and Water Company to the matter. At the meeting of the Pontypool Urban District Council last Wednesday, complaints were again made of shortage of water supply in the upper portion of the district. A letter on the subject was received from Mr. T. B. Pearson, the Secretary of the Pontypool Gas and Water Company, stating that they were making every effort to meet the demand for water, and during recent years had expended considerable sums of money in providing storage reservoirs—largely in excess of their Parliamentary obligation—and in acquiring additional springs. The present shortage was due to quite abnormal circumstances, which were beyond their control; the rainfall this year being 9 inches lower than that of last year. In order to be able to cope with a dry period like the present, the Directors had already commenced to sink a new shaft, and no expense would be spared to carry out the scheme as quickly as possible.

The Directors of Meters Limited have declared interim dividends to the 30th ult., at the rates of 5½ and 5 per cent. per annum, on the preference and ordinary shares respectively.

STATION GOVERNORS

SIMPSON'S PATENT.

Constant Outlet Pressure Maintained under any Conditions.

Water Loading and Withdrawal.

No complicated Balancing needed.

Simple and Effective.

AT WORK OR IN HAND FOR—

CALLINGTON,
CAMBORNE,
ELY,
GOSPORT (3),
ILFRACOMBE,
LISKEARD,
LONDONDERRY,
LOOE,
MAESTEG,
NEATH,
NEWTON ABBOT,
PLYMOUTH (2),
PRINCETOWN,
ST. MARYCHURCH,
TAVISTOCK, &c., &c.

WILLEY & CO., LTD.,

ENGINEERS,

LONDON AND EXETER.

Agents for Scotland: D. M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.

BERLIN MUNICIPAL GAS SUPPLY.

In the "JOURNAL" for the 8th of August (p. 373), we gave, in the course of an article on "Gas Supply on the Continent," particulars in regard to Berlin. The figures quoted were for the year ended March, 1903. Those for the succeeding financial year have since been published; and the following are some extracts from them.

Dealing first with manufacture, 585,100 metric tons of coal were delivered into the works; 82·8 per cent. by rail, the rest by water. The quantity carbonized however, was, 595,281 tons, of which 502,923 tons came from Upper and Lower Silesia, 30,880 tons from Westphalia, 60,205 tons from England, and the remainder from various fields. The maximum number of settings at work was on Dec. 22, 1903, when 392, containing 3323 retorts, received 16,129 charges. The average make of gas per retort per day, with 4 cwt. charges, was about 9700 cubic feet, compared with 9300 cubic feet in the year 1902-3. The total production of gas was about 6770 million cubic feet, and 6260 millions before—an increase of 8·1 per cent. Each ton of coal carbonized in 1903-4 yielded 11,372 cubic feet of gas, compared with 11,300 cubic feet in the preceding twelve months. Its maximum heating power was 5200 calories; its minimum, 4700 calories.

The total quantity of gas consumed in 1903-4 was 6772½ million cubic feet, which was 8·3 per cent. more than was burnt in the preceding twelve months. For the public lamps, about 448 million cubic feet of gas was used, or 6·7 per cent. of the total; being an increase of about 26½ millions, owing to the larger number and greater power of the lamps. The unaccounted-for gas was 3·4 per cent. of the total consumption, compared with 3·3 per cent. before. On March 31, 1904, there were 164,082 ordinary meters and 16,939 prepayment meters in use—together, 181,021. The average cost of an installation, comprising a prepayment meter, with branch-pipe, burner, and cooking-stove, with the incidental expenses, in the year under consideration, was about £5 9s. These installations are put in on condition that the minimum consumption per month will be 900 cubic feet; whereas the average worked out to 1350 cubic feet. The consumption of gas by means of prepayment meters was about 212 million cubic feet, compared with 106 millions before. There were 2318 of these meters repaired, or 13·68 per cent. of the total number in use. There was a diminution to the extent of 59 in the number of gas-engines; but the total motive power was higher—918 engines producing 8151-horse power, compared with 977 engines and 8119-horse power. These differences are explained by the competition of other sources of power—producer gas, electricity, &c.—and the installation of a greater number of motors of from 10 to 80 horse power.

Coming to residuals, the total production of coke in the year 1903-4 was 404,040 metric tons, against 376,509 tons in the preceding twelve months. Adding the generator coke and that in stock, there were altogether 509,184 tons, of which 427,516 tons were sold and utilized. Each ton of coal carbonized yielded rather more than 13 cwt. of coke, 110 lbs. of tar, and 2 cwt. 16 lbs. of ammoniacal liquor. There were 317 tons of retort carbon produced; and 4846 tons of spent purifying materials were sold.

In the department of distribution, there were laid during the year about 30 miles of mains, and about 8 miles taken up. At the end of the financial year, the total length was 692½ miles, consisting of 1,024,390 yards of pipes ranging from 2 to 10 inches, and 194,535 yards from 12½ to 48 inches, in diameter. The number of hours of public lighting was 3675; 1900 up to midnight, and the rest from midnight to daybreak. The incandescent gas system was in use in 29,829 lamps on the 31st of March last year; 16,339 having single burners and 12,386 two burners. In 42 lamps, gas under high pressure, with a single "Millennium" burner, was employed; in 264, there were two of these burners. In 64 lamps, there were two "Selas" burners, also under high pressure; and 40 were fitted with a single Lucas burner. The renewals averaged 7·3 mantles and 2 chimneys per burner; the average "life" of the former being 50·2 days, and of the latter 183·2 days. There were used altogether 230,500 mantles and 58,981 chimneys; and their adjustment, renewal, &c., required a staff of 25 fitters and a similar number of assistants. The "Selas" and "Millennium" burners installed in various streets and in the Zoological Gardens have given good results; and the automatic lighting and extinguishing appliances with which 18 lanterns are fitted have been equally satisfactory.

Reduction in Price to Slot Consumers at Stockport.—At the meeting of the Stockport Town Council last week, a long discussion took place on the Gas Committee's proposal to reduce the price of gas by 3d. per 1000 cubic feet to consumers using penny in-the-slot meters. Mr. Glitters urged that there should be a larger allowance; and he moved, as an amendment, that the reduction should be 6d. Mr. Morley said the reduction of 3d. meant about £6000 less in revenue to the Gas Department; and the Chairman of the Gas Committee (Mr. Alderman White) stated that there were 6000 consumers who had prepayment meters, and there was a loss of 9d. on every 1000 cubic feet of gas supplied to them. The amendment was lost.

Water Supply for Long Buckby.—After many years' delay, a public water supply has at length been provided for Long Buckby. In 1897, an invitation was issued by the Daventry District Council to engineers to send in competitive schemes; and that submitted by Messrs. Usills, Brown, and Usill, of Westminster, was accepted. The contract for the well, reservoirs, and mains was placed with Mr. H. Martin, of Northampton; and Messrs. Fielding and Platt, of Gloucester, had the order for the engine and pumps. The work was commenced in July last year; and it has taken about twelve months to complete. The pumping plant consists of two sets of three-barrel pumps; and the engines (oil) are of 7½ brake horse power. A 14 days' test at the well showed a yield of 6000 gallons per hour. The iron pipes and mains were supplied by the Stanton Iron Company. Hydrants and sluice-wells are provided where necessary; and the pressure is good all over the town. The total cost of the works was about £6500.

The "MAIN" GAS FIRES, 1905-6.

The "Westminster."
Ornamental Design.

Price 45/-.

The 'Canterbury'
Ball Fuel Fire

Price 45/-.

The "Dunkeld"
Nursery Pattern with Boiling Ring on Top.

Price 27/6.

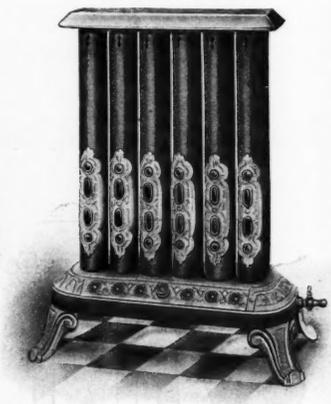
The "Netley."

Prices 24/6 & 30/-.

The "Oxford."

Bright Copper Reflector.
Prices 14/6, 17/6, & 20/-.

The "Durham"
Gas Radiator.



Price 42/6.

LONDON, GLASGOW, FALKIRK.

PLYMOUTH CORPORATION WATER SUPPLY.

The Prevention of Waste.

In his report to the Plymouth Corporation Water Committee for the year ended the 31st of March last Mr. Frank Howarth, Assoc.M.Inst. C.E., the Water Engineer, gives details of the result of an inspection of the whole of the properties within the area of supply, which was carried out with a view of ascertaining for what purposes other than domestic the water was being used. There are over 19,000 separate assessments; and the result of the inspection was to bring 1606 within the borough and 149 outside on the list of persons liable to special charges for trade and other purposes. The effect of this is that the revenue has been increased by £1341 a year. The cost to the Corporation of carrying out the work of inspection was £101. The total income for the year was £31,196; the rentals showing an increase of £1920, while the income from private works, rents, &c., decreased by £900. The charges for maintenance and management came to £10,463; leaving a gross profit of £20,733—an increase of £1054. Payments for interest, sinking fund, and income-tax totalled to £15,741, which was £558 more than the preceding year. The balance appropriated in aid of the rates was £4991; or £496 more than in 1903-4. There has been a small, but steady, augmentation in the income from meter supplies since the trade charges were revised—last year's addition under this head amounting to £263; but, on the other hand, there is a marked falling off in receipts for water used for building purposes.

With regard to the works, it is stated that, at the point where the river enters the reservoir, a weir gauge has been erected for the purpose of measuring the flow off the ground during the summer months, and a flood gauge and automatic recorder, with penstock and bye-channel, are to be added. When completed, these will afford valuable data for use in regard to questions of future storage and the relation between the recorded rainfall and the flow off the drainage area. The 25-inch trunk main between the Burrator and Roborough reservoirs was tested in October last year and found to be practically water-tight. Notwithstanding the large number of air-valves and scour-outs along its course, waste worked out at not more than 2800 gallons in 24 hours. When examined internally, this main was found to have a deposit of peaty mud ⅜ inch thick all round it. Mr. Howarth says that special attention should be given to this fact, as the deposit not only lessens the carrying capacity of this particular main, but also affects adversely all other pipes, meters, and fittings into which it may be conveyed. The 24-inch main between Hartley and Crown Hill was scraped, with the result that the delivery from it was increased by 2,850,000 gallons per 24 hours. The total length of mains is now 125 miles 638 yards; the extensions since 1890 having been 60 miles. Last year, 838 new supplies were laid on; and the total number now is 19,400, of which 972 are meter supplies.

Gratifying progress is being made with the checking of waste. In 1903 the consumption was 45·77 gallons daily per head of the population. In 1904 this was brought down to 41·83 gallons; and last year it was further reduced to 39·34 gallons. In other words, the average daily consumption is less by 269,000 gallons than it was in 1903, though the average population is estimated to have increased by 5107 persons. The system of night inspection is thus bearing fruit; while the renewal of the old iron mains and lead services undoubtedly contributes to the saving of a great deal of water. The proportion of defective fittings is still far too great. During the year covered by the report, 25,048 inspections were made; and the defects found numbered 13,432. When the model bye-laws of the Joint Committee on Water Regulations are published, and full descriptions of standardized fittings are obtainable, Mr. Howarth thinks the abolition of fittings of inferior quality will only be a matter of time.

Bedford Water Supply.—The Bedford Ratepayers' Association have petitioned the Local Government Board to urge upon the Corporation the necessity of providing an adequate and satisfactory supply of water for the borough, in accordance with suggestions made by them more than a year ago; and at the meeting of the Town Council last Wednesday a deputation waited upon them in regard to the matter. Dr. Hoey having addressed the Council, the Mayor replied at some length, and assured the deputation that the Council were giving the subject their best consideration.

Upton-on-Severn Water Supply.—At a meeting of the Upton-on Severn District Council, last Friday, the Clerk submitted the Engineer's report on the tenders for boring, to be carried out for the water scheme. The highest tender received was for £3050; and that of Messrs. Timmins and Sons, of Runcorn, which was recommended for acceptance, was £1328. This did not include the testing scheme, which the Local Government Board insisted upon; and they asked for an additional £130 for this, bringing their tender up to £1458. The recommendation was adopted; and an offer from bankers was accepted to advance the Council £2000 until they could obtain the sanction of the Local Government Board to a loan.

Incandescent Lighting at Weston (Bath).—An arrangement has been entered into between the Weston Parish Council and the Bath Gas Company for the improvement of the lighting of the parish. In reply to inquiries by the Council, the Company offered to convert the present lamps to the incandescent system free of cost, if the Council would enter into a contract for the future lighting and maintenance of the lamps upon the same terms as are paid in Bath. As an alternative, they were willing to continue the lighting at irregular periods on the same terms as hitherto; the Council paying on the average meter system for the gas consumed, and also defraying the cost of converting the lamps. The estimated cost of adapting the lamps for incandescent lighting was £121 8s.; and the Company proposed that this sum should be paid by the Council in three yearly instalments. The Council adopted the alternative offer—being of opinion that all-night lighting all the year round was an unnecessary expense which would involve an increase in the rates. The change is to be carried out at once.

CONSISTENCY, LIMITED.

In November, 1904,

a Trade Circular appeared as a Supplement to the "GAS JOURNAL," with photo of a "NEW" *Condensing* Gas Radiator called the "———."

After proclaiming the virtues of the "———," the Circular had a few lines in italics seeking to discredit Gas *Steam* Radiators.

(Wright's "St. Andrew" had just completed its successful first year!),

and then went on to say, with all the emphasis of Heavy Type and Red Ink:

"The '———' has NO DELICATE "VALVES to get out of order."

"The '———' has NO GLASS WATER "GAUGE, which, besides being in danger "of breakage, gets a dirty deposit inside, "and is liable to neglect."

In October, 1905—

less than a year after—the Authors of that Leaflet had *another one* in circulation, advertising

A GAS STEAM RADIATOR with TWO VALVES and a GLASS WATER GAUGE!

(Before this appeared, Wright's "St. Andrew" had completed its second season—more successful than ever—and is now entered on its third!)

VERB. SAP!

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Of the visit paid this afternoon by the Western District of the Scottish Junior Gas Association to the new gas-works at Falkirk, it may be said that it was marred by two circumstances, but circumstances over which nobody had any control. One was that Mr. W. M'Crae, the Engineer to the Corporation, and the designer of the works, was confined to the house with a bad cold, and the other was the pitiless downpour of rain, which lasted the whole time the Association were in Falkirk. In the midst of the discomfort, however, the members had a good look at the works, and all went away exceedingly well pleased with what they had seen. Probably what was of greatest interest was the machines, by Messrs. R. Dempster and Sons, Limited, of Elland, for charging the retorts and discharging the coke. The visit was too early in time for the members of the Association to see these in their completed state, or at work. They saw, however, the discharging-machine practically complete, and were able to understand its working. The charging-machine was not so far advanced in construction. It was fortunate, however, that the projector had been pushed forward, because, even in its unfixed condition, a good idea could be formed of its method of working. What the Association saw was a completely new works, of the simplest design, part following part with the regularity of the parade ground, housed in buildings of chaste proportions, made up of plant of the most up-to-date description, and all of which, as was said, reflected the greatest credit upon Mr. M'Crae. An admirable feature of the works is the method adopted in them of providing for future extensions. In almost every department the idea is to make the first section the central, and any extension which may be required will be an outward expansion from the portions already in existence. I had a look at the old works before proceeding to the new; and a more wretched, tumble-down place from which to supply a town with gas could scarcely be imagined. Compared with them, the new works will be a veritable paradise.

Speaking at an election meeting in Hamilton on Monday evening, Bailie Hamilton, who is Convener of the Corporation Gas Committee, referred to the trouble they had had with the old chimney at the gas-works. The chimney was built over sixty years ago; and as the outside shell was found to be quite intact and in good order, it was decided to have it re-lined. This was done, at a cost of £120, which would be paid out of revenue in this year's accounts, and was allowed for in the estimates. Since the work was completed, and the chimney brought into use again, and with a new form of retort-setting, most satisfactory results had been obtained from the coal carbonized. Notwithstanding this expense, and a reduetion of £815 in the amount received for tar last year, and the difficulties of making gas while the chimney was under repair, the gross profit for the year was only £60 less than the previous year. The sulphate of ammonia plant still continued to yield a large profit, and had given most satisfactory results since it was introduced into the gas-works. It would be interesting to the ratepayers to know that Hamilton headed the list of towns in obtaining a larger quantity of sulphate per ton of coal carbonized than any other town from which published results had been obtained; showing that not only was the plant working satisfactorily, but that it was one of the best in the market. There was a considerable increase in the quantity of gas sold last year, and also in the number of consumers, which was satisfactory, when the opposition of the electric light was taken into account. Were it not for the new system of piping houses, putting in brackets, and supplying consumers through prepayment meters, from which an increase of 3 million cubic feet of gas sold was obtained last year, the quantity of gas sold would have been less. There was a large field in Hamilton for this class of consumer, which it would require some years to overtake, because more applications for these appliances were coming in than they could supply. The inhabitants of Eddlewood, Cadzow, and Meikle Earnock, and other places outside the burgh, had been applying to be supplied with gas; and with all these consumers in prospect, there was every probability of the gas-works continuing to prosper for many years to come.

The Magistrates of Dunfermline have this week resolved to make application for a Provisional Order empowering them to supply electricity within the burgh. This, I suppose, is intended to protect the community from invasion by the Fife Electric Power Company. Information, it is stated, was laid before the Magistrates regarding the new system of suction-gas plant, and "it was decided to consider this up-to-date method of working along with electricity."

In the Glasgow Town Council on Thursday, Mr. Russell started once more the question of the acquisition of a coalfield from which to supply the Corporation Gas-Works, which has so often before been raised only to be laid aside. He asked the Gas Committee if it were the case, as stated by Mr. Dugald Campbell, one of the Councillors, at a meeting of electors, that the Committee were negotiating for the purchase of a coalfield. Mr. T. Calderwood, the Convener of the Committee, said that, so far as he knew, there was no truth in the statement; whereupon Mr. Dugald Campbell himself came forward and asked if it were not the case that the Gas Manager visited the same coalfield that was considered some years ago. Mr. Calderwood's reply to this was that the Gas Committee had considered the question several times during the past six years, but no action had been taken.

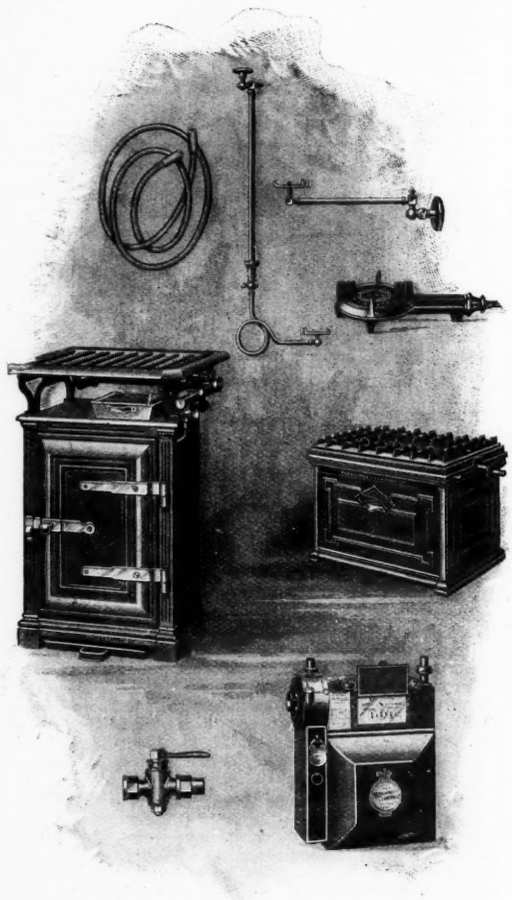
The annual supper of the Directors of the Cupar Gas Company, Limited, was held on Monday evening last—Hon. Sheriff-Substitute Honeyman, the Chairman, presiding. The Chairman, it is reported, made an interesting statement as to the prospects of the Company. Referring to the introduction of gas suction-plants, he said it was fortunate for gas companies that they did not depend upon the sale of gas for power purposes. In their own case, the sale of gas for illuminating and heating purposes was on the increase. He submitted figures to show that the increase was considerable, when they compared the consumption in the past months of the present year with the corresponding period of last year. They had, he said, already more than made up the serious loss which was sustained through the cessation of the supply of gas to the County Asylum two years ago.

PARKINSON'S

COMPLETE

SLOT

INSTALLATIONS.



PARKINSON AND W. & B. COWAN, LTD.

(Parkinson Branch),

Cottage Lane, City Road, LONDON.

Bell Barn Road, BIRMINGHAM.

It was in April, 1895, that the electric lighting scheme of the Corporation of Edinburgh was inaugurated. The installation has all along proved to be one of the most prosperous in the United Kingdom, which was due to various reasons, among which were: That the Corporation were late in entering the field, and had, therefore, the benefit of the experience gained in other places; that they were accorded by Parliament an easy system of financing, which enabled them to offer lower terms from the first than other corporations were able to do; and that, under the guidance of Mr. A. D. Mackenzie, the first Convener of the Committee, an exceedingly enlightened policy was adopted in promoting the cause of the new illuminant. The Convener is now Mr. A. Stevenson. He has issued a memorandum as to the progress of the undertaking during the ten years of its existence. It is shown that in the first year there were 452 consumers, and that there are now 8334. In passing, it may be remarked that there are over 80,000 gas consumers, and that it is thus apparent that the Electric Lighting Department of the Corporation has a long way to travel before it is on anything like an equality with the gas undertaking.

Exceedingly dry weather still continues in the East of Scotland, and water supplies are not improving, but are rather going back. The inhabitants of Kirkcaldy are feeling the pinch for water very keenly. A special meeting of the Kirkcaldy and Dysart Water Commission was held on Tuesday to consider the position of matters. The Clerk reported that during the preceding fortnight the water in the reservoirs had been reduced by 25 million gallons, and that there were now only about 90 million gallons in store. Provost Barnet said that the quantity of water coming in was at the rate of 1,400,000 gallons per day, and that they had to give off as compensation 1,500,000 gallons per day. There was, it was stated, only water to serve for four or five weeks. It was resolved to further restrict the supply, and to approach the Leven Trustees with a request as to what the terms would be for the compensation water being given to the Commissioners for four or six weeks. A Committee was appointed to meet with the Trustees on the subject. There is a serious scarcity of water at nearly all the towns in the county of Fife, with the result that much inconvenience is being caused.

CURRENT SALES OF GAS PRODUCTS.

Week ending Oct. 28.

The London market for tar products continued very firm during the week. Makers are disinclined to sell pitch at present; but the price may be put at 36s. net, near which figure some business is reported to have been done. For this article there is considerable inquiry, both for prompt and forward; one satisfactory feature being that the Continental consumers are responding to the increased price on this side. Solvent naphtha, 91-60, is still in demand, and buyers would pay 11½d. to 1s. net; but sellers are shy. Sixties crude carbolic has advanced somewhat, and a sale is understood to have been made at 1s. 9d., less 1¼ per cent., for this year. Other tar products are unchanged in value. Sulphate of ammonia is rather quiet; but the price remains at £12 17s. 6d. to £13, on Beckton terms, for November delivery.

Sulphate of Ammonia. LIVERPOOL, *Oct.* 28.

The market has been somewhat irregular; demand in Scotland and in London having been well sustained, while orders at other ports have been scarce, and barely sufficient to remove the increasing winter production. The closing quotations are £12 12s. 6d. per ton f.o.b. Hull, £12 15s. per ton f.o.b. Liverpool, and £12 17s. 6d. per ton f.o.b. Leith. There is still fair inquiry in the forward position; but direct buyers do not see their way to paying any substantial premium on spot prices, and no important first-hand business has transpired. On the other hand, the large makers, being already for the most part fully sold up to the end of the year and fairly well sold for delivery over the Spring months, seem inclined to take their chance with the market.

Nitrate of Soda.

This article is steady on spot at 10s. 9d. to 11s. per cwt., according to quality.

Tar Products. LONDON, *Oct.* 28.

Markets have been very active, and there has been a fairly good business doing. In benzol, contracts have again been passed in 90 per cent. at 10½d. for forward delivery; and it is reported that a good quantity has been sold at this price for delivery to the end of April next year. In 50-90 per cent., there has not been very much business doing; but makers are still very firm in their ideas. The demand continues very good in toluol; and it is reported that 11½d. was actually realized for prompt shipment, but only for a limited quantity. There is a strong inquiry for delivery all over next year, but it is very difficult indeed to get makers to quote for this period. Solvent naphtha is still in good demand; but there is certainly rather more offering for both prompt and forward delivery. There is a fairly good business reported in 95 per cent. at 160° for November-December; while the special heavy makes are still largely inquired for. Creosote is decidedly firm, especially in London, where makers are asking 2d. per gallon for good quality oil. Some quantity has, however, been sold in Yorkshire at 1⅞d. for early delivery; but it is understood that 1½d. per gallon was paid for delivery over next year for a large quantity of one of the best makes. In carbolic acid the market has certainly a firmer tone, and considerable business has been done at 1s. 8½d. for October-December delivery. The market does not, however, appear to have improved so far as forward business is concerned. Makers still ask 1s. 9d.; but consumers will not exceed 1s. 8½d. In crystals, the market is decidedly quiet so far as London is concerned; but the German manufacturers appear to be doing a fairly good business for prompt delivery. In pitch, the market continues very strong, and a considerable business has been done for forward delivery. Yorkshire makers report business at 35s. per ton for January-June next year; while London manufacturers report having actually sold at the same price. So far as prompt is concerned,

THE

MAXIM PATENT

CARBURETTOR

For Enriching Gas in Bulk.

Prevents Naphthalene Deposits.

OVER . . . . .

120

MAXIM PATENT CARBURETTORS

HAVE NOW BEEN FIXED.

Among the Companies and Towns supplied are The Gaslight and Coke Company, Manchester, Exeter, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Oldham, Dundee, Perth, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past **Ten Years.**

More Gas and Saleable Coke per Ton of Coal Carbonized is produced; saving Capital, Labour, Fuel, Wear and Tear, &c.

THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

DEALERS IN

Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

For Prices and full Particulars, apply to the

Gas Lighting Improvement Co.

LIMITED,

18, Devonshire Street,

BISHOPSGATE, LONDON, E.C.

there does not appear to be quite so much inquiry; but stocks are not heavy, and prices should be fairly well maintained. Large contracts are reported to have been placed in Lancashire, but prices do not appear to have transpired.

The average values during the week were: Tar, 18s. to 22s. 6d. Pitch, London, 35s.; east coast, 34s. 6d. to 35s. 6d.; west coast, 32s. to 34s. Benzol, 90 per cent., 10½d.; 50-90 per cent., 9⅞d. to 10d. Toluol, 11d. Crude naphtha, 3⅞d. to 4d.; solvent naphtha, 10½d. to 10⅞d.; heavy naphtha, 10½d. to 11d. Creosote, London, 1⅝d.; North, 1⅜d. Heavy oils, 2½d. Carbolic acid, 60 per cent., 1s. 8½d. Refined naphthalene, £4 10s. to £8; salts, 15s. to 17s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market has rather an easier tone, and there does not seem to be quite such a strong demand. Beckton and the South Metropolitan Company still quote £13 for October-November; but there does not appear to have been any business done at this figure. In Liverpool, some small quantities have been placed for early shipment, and the demand appears to be fairly good at this port. Business in Hull was done early in the week at £12 13s. 9d. for November shipment, and further sales are reported to have been made at £12 12s. 6d. for prompt delivery. In Leith, the price still remains £12 17s. 6d.; but there does not appear to be very much business doing for either prompt or forward delivery at this port.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The Lancashire coal trade so far as prices are concerned remains practically stationary. House coal is, however, improving in demand. Many more orders are coming in. Increase in price is talked about; but no official rise has yet taken place. The betterment in trade is proved by the fact that full time is being worked at the pits. There is also an improved inquiry for furnace coal, owing to the impetus in the iron trade, which has during the month increased in a most marked manner. Slack being plentiful, buyers are able to get more by it; but the plenitude has not yet reached a plethoric stage. All orders are met and dealt with as fast as they are received. Prices are firm. Cannel meets with more demand on account of existing contracts; but there are few new inquiries. Coke is very firm indeed for blast-furnaces. More furnaces are being put on. Prices for this commodity show an increase in some districts of from 1s. 6d. to 2s. per ton. The meeting of the Coal Conciliation Board at the Westminster Palace Hotel on Wednesday last resulted in a further adjournment of the question proposed by the masters of a reduction of 5 per cent. in wages. Meetings of operative miners have been held during the week throughout the Lancashire and Cheshire districts to consider the question; the proposal being "That no alteration in the rate of wages shall take place before the end of March next." The miners generally have considered that they were entitled to an advance rather than to suffer a decrease in their rate of pay. Generally, however, the result of the various meetings was an affirmative resolution to the proposal not to alter wages till the end of March next. A conference of miners' delegates was held on the subject in Manchester on Saturday. The representatives of the men on the Conciliation Board—Messrs. S. Walsh, T. Greenall, and Thos. Ashton (Miners' Secretary)—were present. The proposal of non-alteration was discussed; but a decision was arrived at to be laid before the next meeting of the Conciliation Board, to be held at Nottingham on Thursday next, the nature of which it was considered desirable not to make public. The average quotations for coal in the county are as follow: Best house coal 13s. to 14s., secondary 12s. to 13s., common 9s. to 10s., steam and forge coal 8s. to 9s., best engine fuel 7s. 6d. to 8s. 6d., best slack 7s. to 8s., medium 6s. to 7s., common 5s. to 6s. at the pits. Coal for shipping varies—ranging, according to quality, from 8s. to 10s.

Northern Coal Trade.

There is more ease in some branches of the coal trade of the North—the demand from the Baltic ports having fallen off, as is usual at this season. Best Northumbrian steams are quiet at from 8s. 9d. to 8s. 10½d. per ton f.o.b., second-class steams are from 8s. 3d. to 8s. 4½d., and steam smalls are from 4s. 9d. to about 5s. 6d., with some scarcity of the latter sort, owing to the limited working of the collieries in the last two or three weeks. Some of the Durham pits, on the other hand, have increasing briskness in the inquiry, more especially for gas coal. The deliveries on the long and large contracts are now approaching the fullest period; and the tendency of this is to lessen the margin of coals free for sale, and thus to stiffen the prices, more especially of the best Durham gas coals. The quotation for occasional cargoes varies, according to quality, from 8s. 3d. to 9s. per ton f.o.b. For one or two contracts for export, a slightly higher quotation is made where the period of delivery is a prolonged one. One large contract for gas coals is now in the market; and its decision will be of interest. In the coke trade, prices are very firm; but gas coke has to contend with the limitation of the export at the time when the production is increasing, so that the prices are weak—10s. 3d. to 11s. 3d. per ton f.o.b. being this week quoted in Newcastle.

Scotch Coal Trade.

The betterment still continues, as is shown, among other ways, by the shipping figures. The market has been very active, there being a considerable increase in the demand, and some improvement in prices. Beside the sea-borne trade, the home demand is specially strong, large consumers displaying anxiety to purchase forward. Further advances in prices are expected. The quotations are: Main 7s. 3d. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. 3d. to 9s. 3d., and splint 8s. 9d. to 9s. 3d. The shipments for the week amounted to 294,532 tons—an increase of 13,924 tons upon the previous week, and of 16,894 tons upon the corresponding week of last year. For the year to date, the total shipments have amounted to 9,926,918 tons—an increase of 494,149 tons upon 1904.

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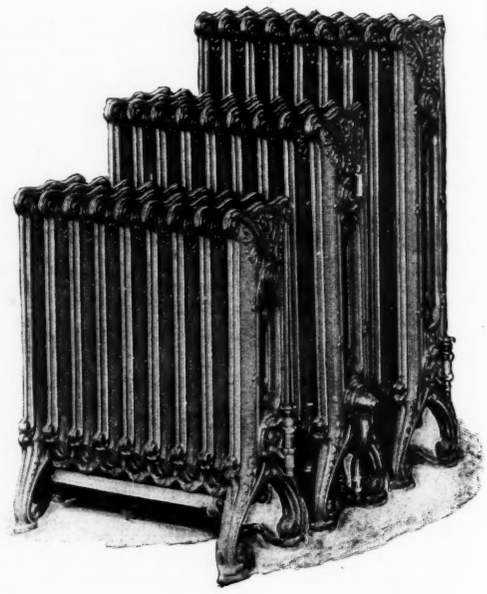

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ADVERTISEMENT OF THE RICHMOND GAS STOVE AND METER CO., LTD.

The Pulsometer Engineering Company, Limited, of London and Reading, have been awarded a gold medal for their exhibits at the Naval Exhibition at Earl's Court.

The New Conveyor Company, Limited, have just published a new catalogue of driving-chains, a unique feature of which is the approximate horse power developed at various speeds per minute, which will be found in the price list.

Mr. James Lee, who for thirty years occupied the position of Manager of the Eccleshill Gas Company, is a candidate for membership of the Bradford City Council, on the ground that his practical experience would be bound to be of great service on the Gas, Electricity, and Water Works Committees.

Mr. A. Austin, of Messrs. George Glover and Co., was the recipient of a handsome testimonial from the staff and workmen, on his leaving the firm, after twenty years' service, to take a position with the Gaslight and Coke Company. The presentation was made at the Phœnix Hotel, Smith Street, Chelsea, on the 20th inst., and took the form of a smoking cabinet embellished with silver. Mr. H. Dormand presided, and, in asking Mr. Austin to accept the gift, expressed the regret of the staff and workmen at losing their old friend and comrade. They, however, wished him success and prosperity in his new undertaking. Other speeches, couched in eulogistic terms, followed. Mr. Austin, acknowledging the testimonial, said he should treasure it as a lasting evidence of the good-will of those who had presented it. A concert followed, and a pleasant evening was spent.

We have received from Messrs. D. Hulett and Co., Limited, of 55, High Holborn, their catalogue of gas-fittings for the season 1905-6. It contains in its 70 large pages a great variety of brackets, pendants, and hall lights, &c., suitable for inverted or ordinary incandescent burners, which are very effectively presented. There is an artistic collection of globes; and among the other contents of the catalogue are arc lamps for inverted incandescent burners, "Lucas" self-intensifying lamps, "Humphrey" arc gas-lamps, street lamps, the pneumatic distance gas lighter, plumbers' brasswork, syphons and force pumps, meters, and "Omega" odourless rapid gas-heaters. This old-established firm are the actual makers of lamps and other apparatus shown in the catalogue; and almost all prices have been reduced.

The Huntly Gas Company was registered in Edinburgh last week. The purpose of the Company is to take over the works and business of the Huntly Gaslight Company. The capital is £10,000 in £1 shares, for which no invitation is issued to the public.

The Electric Turbine Gas-Retort Charging and Discharging Machine Company, Limited, is now being wound up; and the Liquidator is inviting offers for the patent rights granted to the Company by the Paris Gas Company in respect of the machine.

In accordance with the announcement which has appeared in the "JOURNAL," Messrs. Alexander, Daniel, and Co. will offer for sale on Thursday, in £100 lots, £15,000 of 7 per cent. maximum consolidated stock of the Bristol Water Company, at a reserved price of £147.

The Directors of the Continental Union Gas Company, Limited, have decided to recommend dividends of 3½ per cent. for the half year on the ordinary stock, free of income-tax, and a similar dividend on the preference stock, less tax; making 6½ per cent. in the former and 7 per cent. in the latter case for the year.

The owner of a tug was summoned by the Thames Conservancy at Greenwich last week for throwing rubbish into the Thames at Deptford Creek. It appears that while the vessel was being loaded with coke at the South Metropolitan Gas Company's works, some of the coke and dust fell into the creek. Mr. Kettle held that coke was certainly not "rubbish," and dismissed the summons, with £2 2s. costs against the Conservancy.

The Kensington Borough Council had before them last Tuesday a communication from the Welsbach Incandescent Gas Company, Limited, stating that if the Council would undertake to use only the Company's mantles in the public lamps, they would be prepared to agree that the maximum number of mantles for which the Council should pay would not exceed eight per burner per annum, and that the mantles would be supplied at the rate of 36s. per gross. The Works Committee reported that a saving to the borough would result from the proposed arrangement; and it was resolved to accept the offer, subject to the Company agreeing to a condition that the question of the renewal of the mantles should be left entirely to the Council's Lighting Engineer (Mr. P. Monson).

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

WORKS MANAGER (5 million feet per day works). No. 4488.
TRAVELLER (COAL TRADE). No. 4481.
RETORT SETTERS. Isle of Thanet Gas Company.
GAS FITTERS. Reading Gas Company.
RENTAL CLERK. Nuneaton Gas Works.

Situations Wanted.

ASSISTANT MANAGER OR WORKS FOREMAN. Tully, New Southgate.

Plant (Second-Hand) Wanted.

TOWER SCRUBBER. No. 4491.
GASHOLDER AND TANK. No. 4492.
LIQUOR PUMPS. Minehead Gas Works.

Plant, &c., for Sale.

"JOURNAL" VOLS. No. 4483.
CLEGG'S TREATISE OF COAL GAS. No. 4489.
RETORT BENCH FITTINGS. Minehead Gas Works.

Patents for Sale.

ELECTRIC TURBINE RETORT CHARGING AND DISCHARGING MACHINE. Wenham, Cannon Street, E.C.

Company Meeting.

PORTSMOUTH WATER COMPANY. Offices, Nov. 23. Three o'clock.

Stocks and Shares.

GRAYS GAS COMPANY. Nov. 14.
SOUTH ESSEX WATER COMPANY. Tenders by Nov. 21.
SOUTHEND GAS COMPANY. Nov. 7.
WANDSWORTH AND PUTNEY GAS COMPANY. Nov. 14.

TENDERS FOR

Coal.

BELFAST GAS DEPARTMENT. Tenders by Nov. 16.

Fire-Clay Goods.

BIRMINGHAM GAS DEPARTMENT. Tenders by Nov. 6.
ISLE OF THANET GAS COMPANY. Tenders by Nov. 2.

Purifiers, &c.

COVENTRY GAS DEPARTMENT. Tenders by Nov. 13.

Tar and Liquor.

BANGOR GAS DEPARTMENT. Tenders by Nov. 14.
TAMWORTH GASLIGHT AND COKE COMPANY. Tenders by Nov. 13.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 291.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	21½—22½	+¼	4 13 4
160,000	10	,,	7½	Do. 7 p.c.	14—14½	..	5 3 5
200,000	5	May 12	6½	Bombay, Ltd.	6¾—7¼	..	4 9 8
40,000	5	,,	6½	Do. New, £4 paid	5¼—5¾	..	4 10 6
50,000	10	Aug. 31	14	Bourne-) 10 p.c. . .	29—30	..	4 13 4
51,810	10	,,	7	mouth Gas) B 7 p.c. .	17—18	+½	3 17 9
53,200	10	,,	6	and Water) Pref. 6 p.c.	15½—16½	..	3 12 9
380,000	Stk.	Aug. 16	12½	Brentford Consolidated	250—255	..	4 18 1
300,000	,,	,,	9½	Do. New . . .	190—195	..	4 17 5
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
206,250	,,	June 15	4	Do. 4 p.c. Deb. .	103—106	..	3 15 6
220,000	Stk.	Sept. 15	11½	Brighton & Hove Orig.	220—225	..	5 0 0
246,320	,,	,,	8½	Do. A. Ord. Stk. .	160—165	..	5 0 0
460,000	20	Sept. 28	10	British	42½—43½	..	4 11 11
100,000	Stk.	Aug. 16	6	Bromley, Ord. 5 p.c. .	119—123	..	4 17 7
165,700	,,	,,	4½	Do. do. 3½ p.c. .	89—93	..	4 16 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	12½—13	−¼	5 7 8
250,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
150,000	20	July 13	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 28	10	Cape Town & Dis., Ltd.	17—17½	..	5 14 3
100,000	10	Oct. 27	4½	Do. 4½ p.c Pref.. .	10—10½*	..	4 5 9
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	102—104	..	4 6 7
1,400,000	Stk.	Aug. 31	5⅛	Commercial 4 p.c Stk. .	116—119	..	4 7 4
560,000	,,	,,	5	Do. 3½ p.c. do. .	113—115	..	4 6 11
450,000	,,	June 15	3	Do. 3 p.c. Deb. Stk.	86—88	..	3 8 2
800,000	Stk.	,,	6½†	Continental Union, Ltd.	119—122	..	4 18 4
200,000	,,	,,	7	Do. 7 p.c Pref.	138—143	+1	4 17 11
424,070	Stk.	—	5½	Derby Con. Stk. . . .	—	..	—
55,000	,,	June 3	4	Do. Deb. Stk. . . .	—	..	—
486,090	10	July 28	11	European, Ltd. . . .	22½—23½	..	4 13 7
354,060	10	,,	11	Do. £7 10s. paid	14½—15½	..	5 6 5
15,223,235	Stk.	Aug. 16	4⅛	Gas-) 4 p.c. Ord. . .	99—100	−1	4 8 0
2,600,000	,,	,,	3½	light) 3½ p.c. max. .	90—92	..	3 16 1
3,799,735	,,	,,	4	and) 4 p.c. Con. Pref.	110—113	..	3 10 10
4,193,975	,,	June 15	3	Coke) 3 p.c. Con. Deb.	85—87	−1	3 9 0
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	98—101	..	4 19 0
70,000	10	Oct. 13	11	Hongkong & China, Ltd.	19½—20½	..	5 7 4
3,800,000	Stk.	May 12	10	Imperial Continental .	219—222	..	4 10 1
473,600	Stk.	Aug. 16	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 5
175,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	122—127	..	4 14 6
561,000	Stk.	Aug. 16	10	Liverpool United A . .	231—233	+2	4 5 10
718,100	,,	,,	7	Do. do. B . .	172—174	..	4 0 6

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
306,083	Stk.	June 29	4	L'rpool Unit'd Deb. Stk.	111—113	..	3 10 10
75,000	5	,,	5	Malta & Medn., Ltd. .	4¼—4⅝	..	5 5 3
560,000	100	Oct. 2	5	Met. of) 5 p.c. Deb..	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	May 31	3½	Monte Video, Ltd. . .	12—13	..	5 7 8
1,565,892	Stk.	July 29	4¼	Newc'tle & G'tesh'd Con.	106—108	+½	4 5 8
406,625	Stk.	June 29	3½	Do. 3½ p.c. Deb.	99—101	+1	3 9 4
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	18½—19½	..	5 2 7
52,940	1	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	May 12	8	Oriental, Ltd. . . .	146—149	..	5 7 5
600,000	5	Sept. 14	7	Ottoman, Ltd. . .	6—6½	..	5 7 8
168,255	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	6	Primitiva Ord. . . .	6½—7	..	4 5 9
796,980	5	July 28	5	Do. 5 p.c. Pref. .	5¼—5½	..	4 10 11
488,900	100	June 1	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
851,070	10	Oct. 13	7	River Plate Ord. . . .	12¾—13¼	−¼	5 5 8
300,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Sept. 28	7	San Paulo, Ltd. . . .	13—13⅜	..	5 3 8
70,000	50	July 1	5	Do. 5 p.c. Deb. .	51—53	..	4 14 4
135,000	Stk.	Sept. 14	10	Sheffield A	242—244	+3	4 2 0
209,984	,,	,,	10	Do. B	242—244	+3	4 2 0
523,498	,,	,,	10	Do. C	242—244	+3	4 2 0
126,106	Stk.	Aug. 31	5½	Shrewsbury Ord. 5 p.c.	104—106	..	5 3 9
70,000	10	Sept. 28	10	South African	15½—16½	..	6 1 3
6,250,000	Stk.	Aug. 16	5½	South Met., 4 p.c. Ord.	127—129	−1	4 5 3
1,895,445	,,	July 13	3	Do. 3 p.c. Deb.	87—89	..	3 7 5
575,000	Stk.	Aug. 16	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	125—130	..	3 16 11
112,533	,,	July 13	5	Do. 5 p.c. Deb. Stk.	132—137	..	3 13 0
502,310	Stk.	May 12	5	Southampton Ord. . . .	111—114	..	4 7 9
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6¼	Tottenham) A 5 p.c. .	122—125	..	5 0 0
363,020	,,	,,	4½	and) B 3½ p.c. .	96—99	..	4 16 0
125,000	,,	June 29	4	Edmonton) 4 p.c. Deb.	105—108	..	3 14 1
182,380	10	June 15	8	Tuscan, Ltd.	9¾—10¼	..	7 16 1
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100—102	..	4 18 0
30,000	Stk.	Aug. 16	7½	Wands-) A 5 p.c. . .	—	..	—
255,636	,,	,,	6¼	worth) B 3½ p.c. . .	137—140	..	4 9 3
60,000	,,	,,	5⅛	and) C 3½ p.c. . .	113—116	..	4 13 6
57,564	,,	June 29	3	Putney) 3 p.c. Deb. Stk.	82—85	..	3 10 7
745,872	,,	Aug. 16	5	West Ham 5 p.c. Ord. .	104—106	..	4 14 4
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	122—125	..	4 0 0
193,300	,,	June 29	4	Do. 4 p.c. Deb. Stk.	104—109	..	3 13 5

Prices marked * are "Ex. div." † Next dividend will be at this rate.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

SITUATION Wanted as Assistant MANAGER or WORKS FOREMAN. Age 24. Experienced in Adjusting and Working Regenerative Settings, Slopers, Horizontals, and Machine Stokers, Water-Gas Installations, Sulphate and Ammonia Concentrating Plants, and General Gas-Works Construction. Good Chemist and Draughtsman.
Address, S. J. B. TULLY, 2, Pembroke Road, NEW SOUTHGATE.

RENTAL Clerk wanted at once. Young, Intelligent, Smart, and of good Address.
Apply to Mr. G. HELPS, Gas-Works, NUNEATON.

TRAVELLER (Experienced) wanted by Old-Established Firm in the Gas Coal Trade to work Eastern Counties and South. Every encouragement given to one with good Connection.
Address, in confidence, stating Age, previous Experience, and Salary required, to No. 4481, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Reading Gas Company, one or two thoroughly experienced GAS-FITTERS. No one need apply who is not thoroughly competent to do all kinds of barrel and fitting work.
Applications, stating Age, Experience, and Wages required, together with *Copies* of one or more recent Testimonials, to be sent to the undersigned.
D. H. HELPS, Assoc.M.Inst.C.E.,
Engineer and Manager.
Gas-Works,
King's Road, Reading.

ISLE OF THANET GASLIGHT AND COKE COMPANY.
WANTED, Two Competent Retort SETTERS. Must understand Inclined Retorts and Regenerative Furnaces.
Apply, stating Wages required, to the undersigned, not later than Wednesday, November 1.
FRANK A. WINSTANLEY,
Engineer and Manager.
The Offices,
The Dane, Margate.

WANTED, by a large Provincial Gas Company, an Experienced WORKS MANAGER capable of taking Entire Control of Works, making Five Million Cubic feet per day. Applicants must have had considerable Experience in Regenerator Settings, Drawing and Charging Machinery, also Coal and Coke Conveying Plant. House, Coal, and Gas provided free. Age not to exceed 40 years.
Applications, by letter, stating Age, Experience, and Salary, with *copies* only of recent Testimonials, to No. 4488, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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Telephone: 341, AVENUE.

WANTED, a Second-Hand Cast-Iron or Steel TANK and GASHOLDER, the latter to be about 40,000 to 60,000 cubic feet capacity. Tank to be erected on foundations provided by purchasers.
Address, No. 4492, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Second-Hand Tower SCRUBBER, about 5 feet diameter and 50 feet high, suitable for a make of 1,000,000 Cubic Feet per Twenty-four hours.
Address No. 4491, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Engineer leaving England to take up an Appointment abroad, is desirous of disposing of his set of "JOURNALS," consisting of Bound Volumes—in half leather—from 1875 to 1896, and a number of Unbound Copies. May be inspected at the "JOURNAL" Offices.
Offers to be addressed to No. 4483, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

"CLEGG'S TREATISE ON COAL GAS."
WHAT offers for a well-preserved copy of "A Practical Treatise on the Manufacture and Distribution of Coal Gas: Its Introduction and Progressive Improvement." By Samuel Clegg, junr. Third Edition, published 1859.
The book can be seen at the "JOURNAL" Offices, and offers may be addressed to No. 4489, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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THE Liquidator of the Electric Turbine GAS RETORT CHARGING and DISCHARGING MACHINE COMPANY, LIMITED, offers for Sale the valuable Patent Rights (valid in Great Britain, with rights of application in other Countries and Colonies) to Make and Sell Turbine Retort Charging and Discharging Machines.
Such Machines are now working with the most satisfactory results at the works of the Compagnie Parisienne d'Eclairage et Chauffage par le Gaz in Paris, at the new works of the Société d'Eclairage, Chauffage, et Force Motrice at Gennevilliers in the suburbs of Paris, and at other places.
Offers should be made to the Liquidator, Mr. W. K. WENHAM, 27, Martin's Lane, CANNON STREET, E.C.

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J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

ISLE OF THANET GASLIGHT AND COKE COMPANY.

THE Directors are prepared to receive TENDERS for the supply and delivery of INCLINED RETORTS, FIRE-BRICKS, &c.

Forms of Tender may be obtained on application to the undersigned.

Tenders to be addressed to the Chairman, and endorsed "Fire-Brick Goods," so as to be received not later than Thursday, November 2 next.

FRANK A. WINSTANLEY,
Engineer and Manager.

The Offices,
The Dane, Margate.

CITY OF BELFAST.

CONTRACT FOR COAL.

THE Gas Committee of the Belfast Corporation invite TENDERS for a supply of 70,000 Tons of Best Screened GAS COAL, to be delivered free and trimmed in Barges at Belfast Harbour, between the 1st of January and the 30th of September, 1906.

No Tender for less than 10,000 Tons will be considered.

OR ALTERNATIVELY for 170,000 Tons, to be delivered, under same conditions as above, between the 1st of January, 1906, and the 30th of September, 1907.

No Tender for less than 25,000 Tons will be considered.

Monthly quantities and Particulars may be obtained from the Manager of the Gas-Works.

Tenders, on Office Forms, endorsed "Tender for Coal," to be delivered at my Office not later than the 16th of November, 1905.

The lowest or any Tender not necessarily accepted.

SAMUEL BLACK,
Town Clerk.

PURIFIERS.

THE Gas Committee of the Coventry Corporation invite TENDERS for the Supply and Erection, at their Foleshill Works, of Six PURIFIERS, each 30 feet wide by 6 feet deep. Four of the Purifiers to be 50 feet long, and two to be 60 feet long each, with 24-inch diameter Valves and Connections.

Specification and Form of Tender, with Bill of Quantities, may be obtained on application from the undersigned, and Prints of the Drawings will be supplied on payment of Two Guineas, which will *not* be returned.

The Committee do not bind themselves to accept the lowest or any Tender.

Tenders must be delivered not later than the first post on Monday, the 13th day of November next, addressed to the Chairman of the Gas Committee, Gas-Works, Coventry, and endorsed "Tender for Purifiers."

FLETCHER W. STEVENSON,
Engineer and General Manager.

Gas-Works, Coventry,
Oct. 25, 1905.

CITY OF BIRMINGHAM.

(GAS DEPARTMENT.)

RETORTS, RETORT MATERIAL, &c.

TENDERS are invited for the Retorts, RETORT MATERIAL, FIRE-BRICKS, FIRE-CLAY, SILICA BRICKS, and SILICA CEMENT required by the Gas Committee during the Year 1906.

Drawings of Retorts, &c., can be seen at the Office of the Engineer-in-Chief, Gas-Works, Duddeston Mill Road, Saltley.

Conditions and Forms of Tender (price 5s. each, which will be returned provided a *bonâ-fide* Tender is sent in on or before the 6th day of November) may be obtained upon application at my Office.

Separate Forms of Tender are issued for each Contract, and applicants must specify the Forms required.

The Committee do not bind themselves to accept the lowest or any Tender, and reserve to themselves the right to accept a portion of any Tender.

G. HAMPTON BARBER,
Secretary.

City Gas Offices,
Council House, Birmingham,
Oct. 25, 1905.

TO TAR DISTILLERS.

THE Gas Committee of the Corporation of Bangor are prepared to receive TENDERS for the surplus TAR produced at their Gas-Works for a period of One or more Years.

The Tar will be loaded at the Bangor Station, L. & N.W. Railway. The Contractor to provide portable Tanks to hold about One Ton.

Security to be given for the due performance of the Contract.

Quantity of Tar, about 250 Tons.

Payments to be made monthly.

Further Particulars may be had on application to the undersigned.

Tenders to be sent in on or before the 14th day of November, 1905.

The Committee do not pledge themselves to accept the highest or any Tender.

JOHN SMITH,
Manager.

Gas-Works, Bangor,
N. Wales, Oct. 27, 1905.

TAMWORTH GAS LIGHT AND COKE COMPANY.

THE Directors of the above Company invite TENDERS for the purchase of the surplus TAR and LIQUOR made at their Gas-Works, for a term of One Year from the 18th of November, 1905.

Tenders, marked "Surplus Tar and Liquor," to be delivered to the undersigned on or before the 13th day of November, 1905.

W. A. SAPEY,
Manager and Secretary.

Gas-Works, Tamworth,
Oct. 28, 1905.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

NOTICE OF HALF-YEARLY MEETING.

NOTICE is Hereby Given, that the next ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of this Company will be held at the Company's Offices, Commercial Road, Portsmouth, on Thursday, the 23rd day of November, 1905, at Three o'clock in the Afternoon, on the following Business:—

To receive the Accounts and Balance-Sheets to the 30th of September last, and the Directors' Report.
To declare Dividends.
And for the transaction of the other Ordinary Business of the Company.

The REGISTER OF TRANSFERS WILL BE CLOSED from the 10th day of November, 1905, to the 23rd day of November, 1905, both days inclusive.

Dated this 26th day of October, 1905.

By Order of the Board of Directors,
J. L. WILKINSON,
Secretary to the Company.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

NOTICE OF SPECIAL GENERAL MEETING.

NOTICE is Hereby Given, that, in accordance with the Standing Orders of Parliament, a SPECIAL GENERAL MEETING of the Proprietors in this Company will be held at 3.15 o'clock in the afternoon of Thursday, the 23rd day of November, 1905, at the Company's Offices, 26 and 28, Commercial Road, Portsmouth, for the purpose of considering, and, if thought fit, of approving, a Bill proposed to be introduced into Parliament in the present Session entitled "A Bill to confer further powers upon the Borough of Portsmouth Water-Works Company; to extend their limits for the supply of Water; to authorize the Construction of Works and the raising of Money; and for other purposes."

Dated this 26th day of October, 1905.

By Order of the Board of Directors,
J. L. WILKINSON,
Secretary to the Company.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £20,000 NEW ORDINARY "B" STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 7, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
GRAYS GAS COMPANY, LIMITED.

NEW ISSUE OF 600 £10 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £10,000 THREE PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTH ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF £10,000 FIVE PER CENT. PREFERENCE STOCK,
AND
£6000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 21, at Two o'clock, in Lots.

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TWENTY-EIGHTH ANNUAL ISSUE.

GAS-WORKS DIRECTORY AND STATISTICS 1905-6

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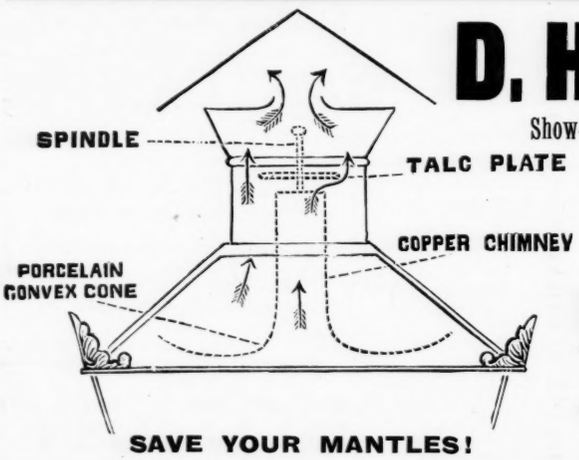

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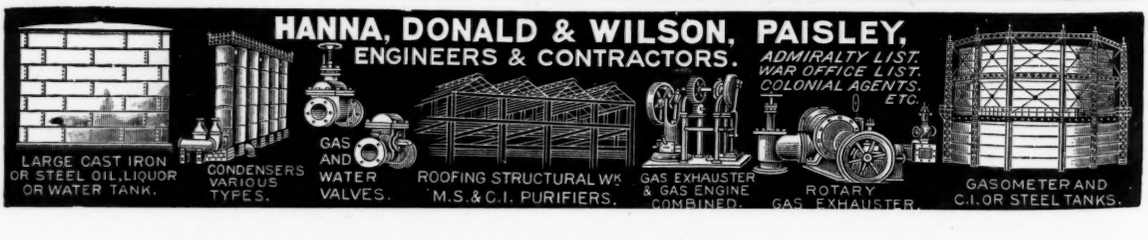
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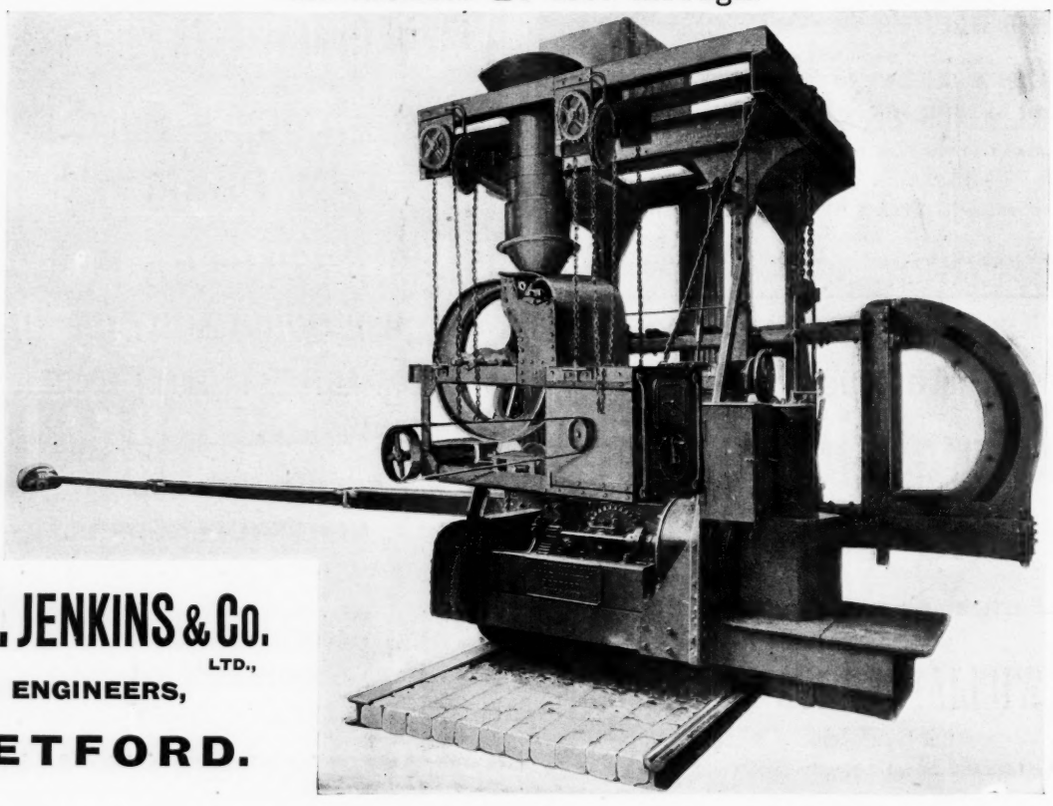

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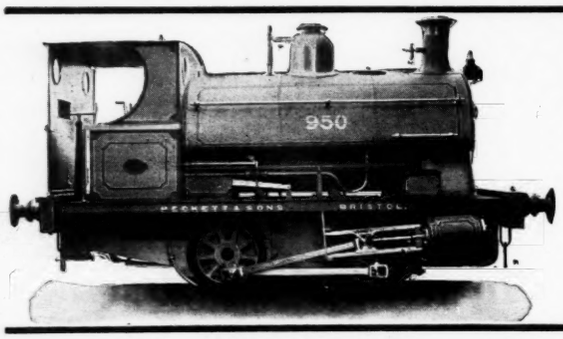
PREPAYMENT METERS for Pennies, Shillings, or any other Coin.



LOCOMOTIVES

LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for immediate delivery.
Photographs, Specifications, and Prices on Application.
PECKETT & SONS, Atlas Locomotive Works, **BRISTOL.**
Telegraphic Address: "PECKETT, BRISTOL."

JOHN BROWN & CO., LTD., SHEFFIELD,
Proprietors of
ALDWARKE MAIN, CAR HOUSE, & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.
ALDWARKE MAIN GAS COAL
Analysis: 12,600 Feet of 19-Candle Gas per Ton.
Value in Pounds of Sperm, 820·20.
VERY FREE FROM IMPURITIES.
TELEGRAMS: "ATLAS, SHEFFIELD."

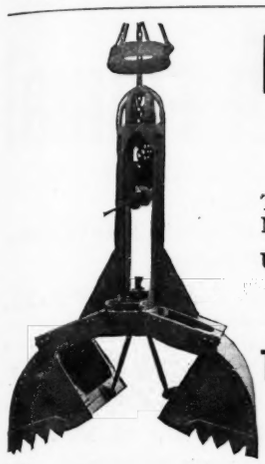
Price, with Four Burners, **52/6** List.

FIG. I. 429.

Price, without Burners, **47/6** List.

SEASON 1905-1906.
THE NEW
SOLID COPPER DOUBLE CASE "ARC" LAMP
(COWAN'S PATENT No. 23,616)
With Patent Cock at Bottom, for Outside Lighting.

SHADOWLESS. NO FLASHLIGHTS. NO CHIMNEYS.
No Wire Gauze or Chains. No Springs or other Fragile parts used in the construction of these Lamps.
ESTIMATED ILLUMINATING POWER, 400 TO 500 CANDLES.
Any of the "C" Mantles of Commerce can be used.
WIND AND WEATHER-PROOF.
One Pilot-Light only used to light all the Burners.
The Enamelled Gas-Way, being central, is Shadowless.
Length over all 24 inches.
Can be supplied with Clear, Alabastrine, or Opal and Clear (Diagonal) Globes.
Also made with Bye-Pass Lever Cock on top.
STRONG COLD ROLLED COPPER OUTER AND INNER CASES.
MANUFACTURED BY
GUEST & CHRIMES, FOUNDRY & GENERAL BRASS WORKS, **ROTHERHAM.**



HONE'S PATENT GRABS

Automatic, Efficient, & Economical.

APPLICABLE TO ANY ORDINARY SINGLE CHAIN CRANE.

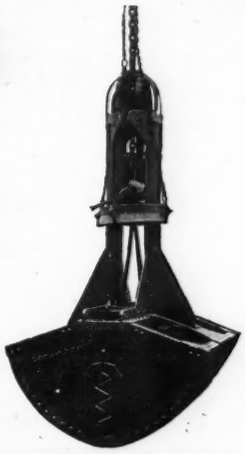
These Grabs are unequalled for handling Coal, Coke, Ballast, Sand, Macadam, Ores, &c., effecting in all cases very substantial savings.

Used by all the Principal Gas Companies, Colliery Owners, Coal Merchants, Engineers, Contractors, &c., at Home and Abroad.

Applications for Prices and Particulars are invited by the Sole Manufacturer—

THE THAMES IRON WORKS, SHIPBUILDING, and ENGINEERING COMPANY, LTD.,

CANNING TOWN, LONDON, E.



EVERED & CO., LTD.,

27 to 35, DRURY LANE, LONDON.
SURREY WORKS, SMETHWICK.
BARNET WORKS, BIRMINGHAM.

Brass Gas-Fittings Manufactory—SURREY WORKS, SMETHWICK.

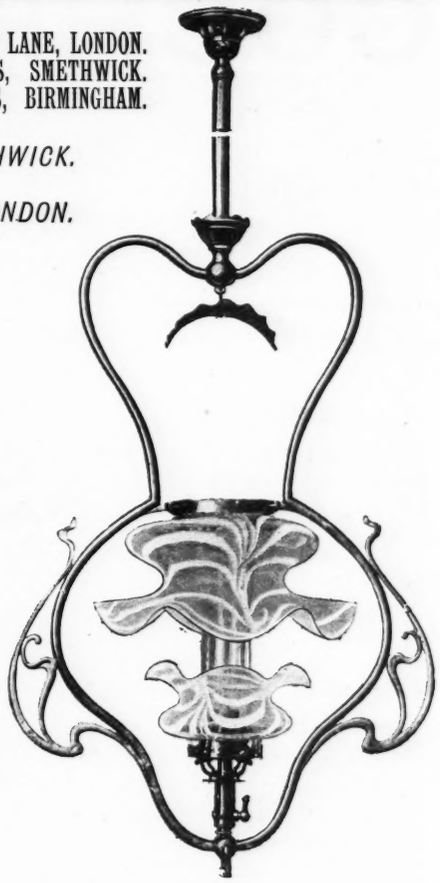
Wrought-Iron Gas-Fittings Manufactory—DRURY LANE, LONDON.

8869.

ANTIQUE FITTINGS

FOR

Ordinary and Incandescent Gas Burners.



8479—Length, 42-in. overall. ⅜-in. Rod. ⅜-in. Arms. Including 10-inch Crystal and White Enamelled Shade and Eye Screen.

SHOREDITCH DEPÔT—

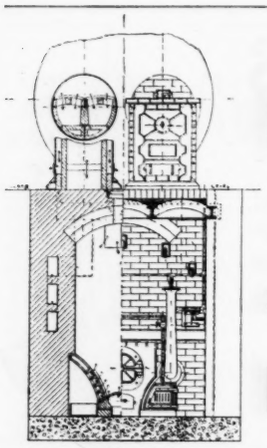
143, HIGH STREET.

IMPORTANT NOTICE.

It is the practice of the "Gas World" to publish from time to time analyses of the accounts of Gas Undertakings in this Country. A number of such analyses appeared in the issue for September 16, and they show that at Fenton, Longton, Rotherham, and Tipton, some of the highest results were obtained in Gas Made and Coke Sold.

It may be interesting to Gas Engineers to learn that at these four places Winstanley's Settings are in use.

The Winstanley Speciality Company, Newton Chambers, Cannon Street, Birmingham.



HISLOP'S
PATENT SYSTEM OF BOILER FIRING.

20 % Saving in Fuel.
20 % more Water Evaporated per hour.
Steady Steam Pressure.
Fuel Employed—Coal or Coke.

Perfect Combustion—17 to 18 % CO_2 in Waste Gases.
Producer Cleaned once in 24 to 48 hours.
Applicable to all Boilers.

INEXPENSIVE. DURABLE. SIMPLE.

DESIGNS AND ESTIMATES FROM

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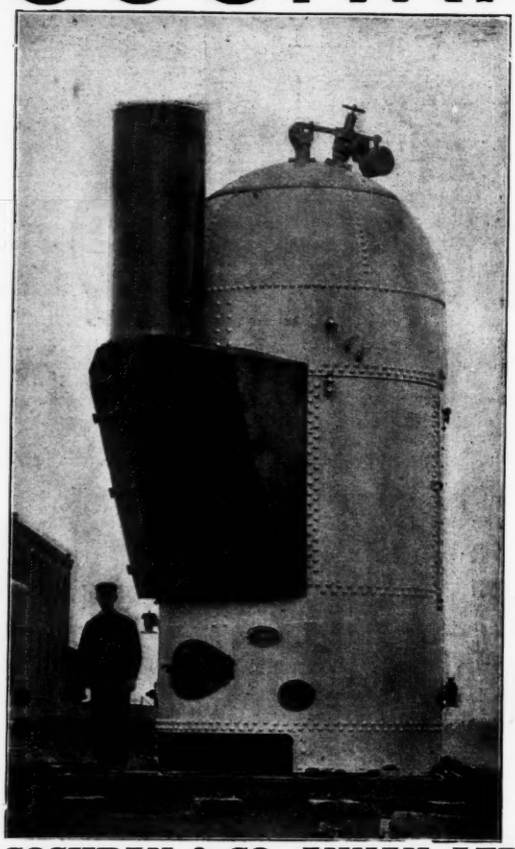
LONDON—87, VICTORIA STREET, S.W.

COCHRAN

PATENT VERTICAL
MULTITUBULAR

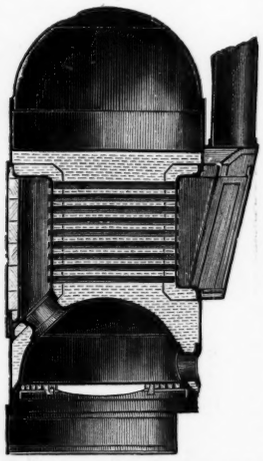
BOILERS.



WRITE FOR LIST A/3

SINGLE BOILERS
FROM
10 TO 150
I. H. P.

BATTERIES
UP TO
ANY POWER.



London Office: **SANCTUARY HOUSE, TOTHILL STREET, WESTMINSTER.**
Telegrams: "MULTITUBE, LONDON."
Telephone: 650 VICTORIA.

COCHRAN & CO., ANNAN, LTD., ANNAN, SCOTLAND. Telegrams: "MULTITUBE, ANNAN."

COAL TAR PRODUCTS.

Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbolic Acid, Crude Creosote Salts, Granulated (Crude) Naphthalene, Sublimed Naphthalene, Anthracene, Refined Tar, Pitch, also Sulphate of Ammonia.

For Prices apply to the **SOUTH METROPOLITAN GAS COMPANY,**

Works: ORDNANCE WHARF, EAST GREENWICH, LONDON, S.E.

709, OLD KENT ROAD, LONDON, S.E.

Telegraphic Address: "METROGAS, LONDON."

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ORIGINAL NEW INVERTED BURNERS.

The "BIJOU" BURNER is the neatest, most decorative, and economical ever known, and is the real rival to Electric Light at One-Tenth the cost.

No. 3 "BIJOU" BURNER.

All Mantles we supply are made of best double-woven Ramie, and marked with our Trade Mark,

"NICO."

No. 2 BURNER.

INVERTED FITTINGS OF EVERY DESCRIPTION AND UP-TO-DATE DESIGNS.

The New Inverted Incandescent Gas Lamp Co., Ld.

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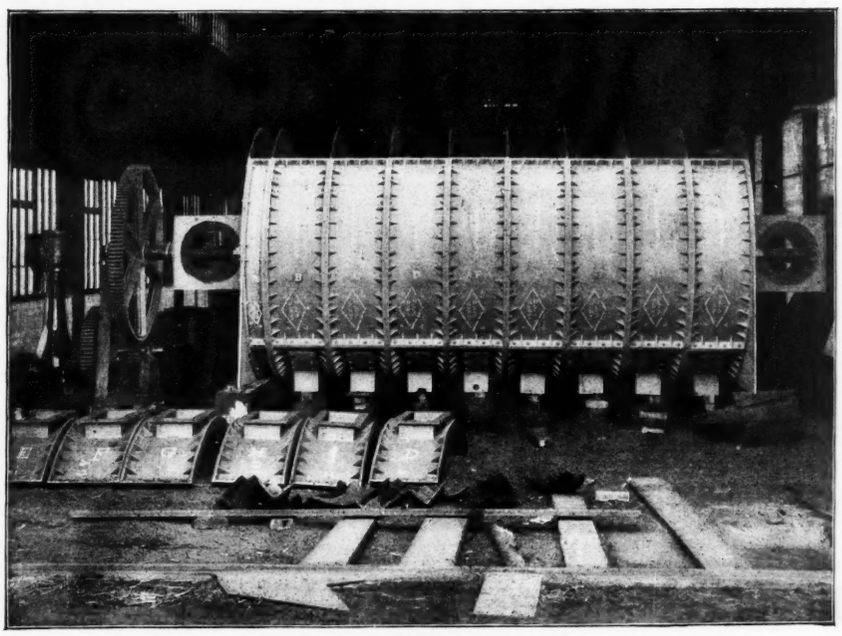
THE WHESSOE FOUNDRY CO., LTD.

Works: DARLINGTON.

LARGE AREA OF WASHING SURFACE.

REMOVAL OF THE WHOLE OF THE AMMONIA AND A LARGE PERCENTAGE OF CO_2 AND SH_2.



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BUNDLES EASILY ACCESSIBLE FOR CLEANING.

"Whessoe" Rotary Washer-Scrubber (H. Kirkham & Chandler's patent). **Capacity 1,500,000 Cub. ft. per diem.**
One of Two Machines supplied by us to a Foreign Gas-Works, photographed in our shops during course of construction.

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TELEGRAMS—
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WEST'S GAS IMPROVEMENT CO., LD.

Gas and General Engineers.

CONTRACTORS FOR
COMPLETE RETORT-HOUSE PLANT

. . EITHER ON . . .

THE HORIZONTAL OR INCLINED SYSTEMS.

WEST'S STOKING MACHINERY— COMPRESSED AIR OR ELECTRICALLY DRIVEN AND MANUAL SYSTEMS.

Example of a

RETORT-HOUSE

illustrating the application of

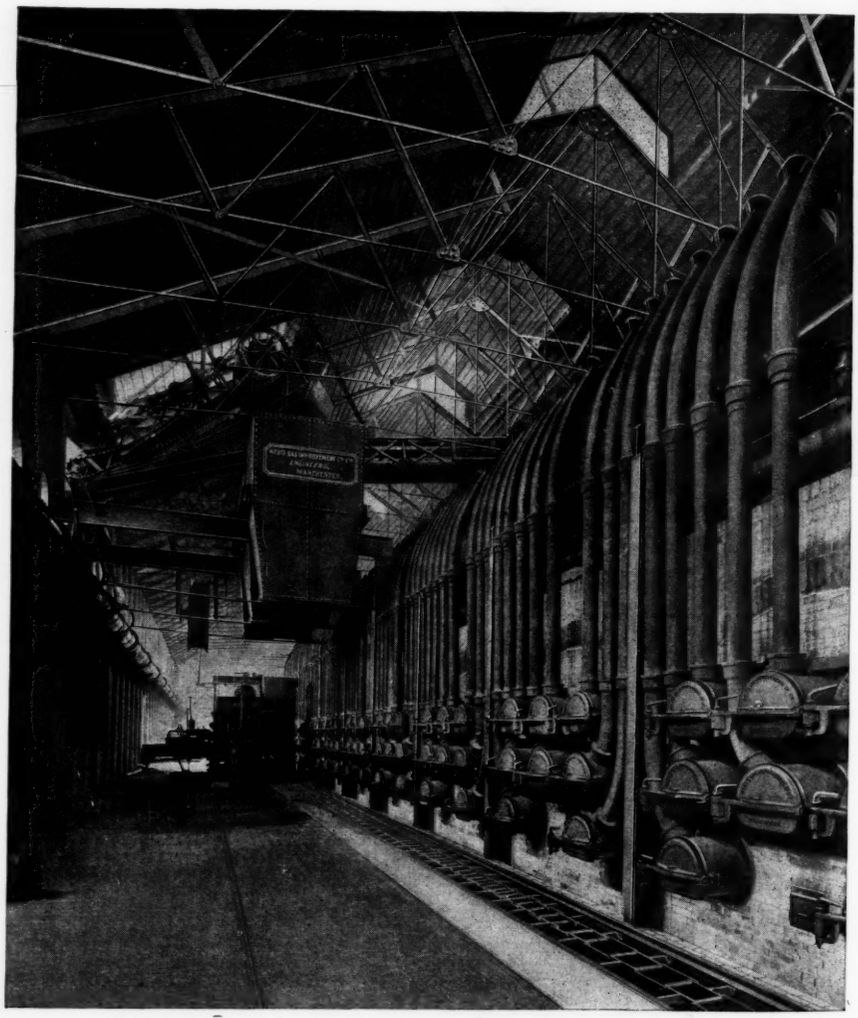
West's Regenerator Settings and Retort-Bench Fittings.

West's Coal and Hot Coke Plants.

West's combined Charging and Drawing Machines.

The "Bournemouth" Arch Pipe
(WOODALL, HEAD, AND GREEN'S PATENT).

The "Hovey" Indicator
is fitted to the overhead Coal-Hoppers for gauging the depth of Coal contained in them.



With the **WEST'S COMBINED CHARGING AND DRAWING MACHINE** all classes of coal can be efficiently dealt with, and it requires only One Machine Driver and One Attendant to charge and draw the Retorts, attend to the Mouthpieces, and fill the Furnaces.

COAL AND COKE BREAKING, ELEVATING, AND STORING PLANTS

BELTON'S PATENT AUTOMATIC RELIEF APPARATUS FOR HYDRAULIC MAINS.

Manufacturers for America: Riter-Conley Manufacturing Company, Pittsburg.

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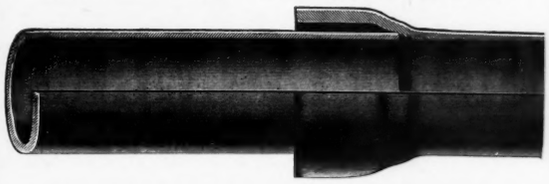

WELDLESS STEEL SPIGOT AND FAUCET PIPES

In any Length up to 40 feet for

GAS & WATER MAINS.

A PERFECT SUBSTITUTE FOR CAST-IRON MAINS.

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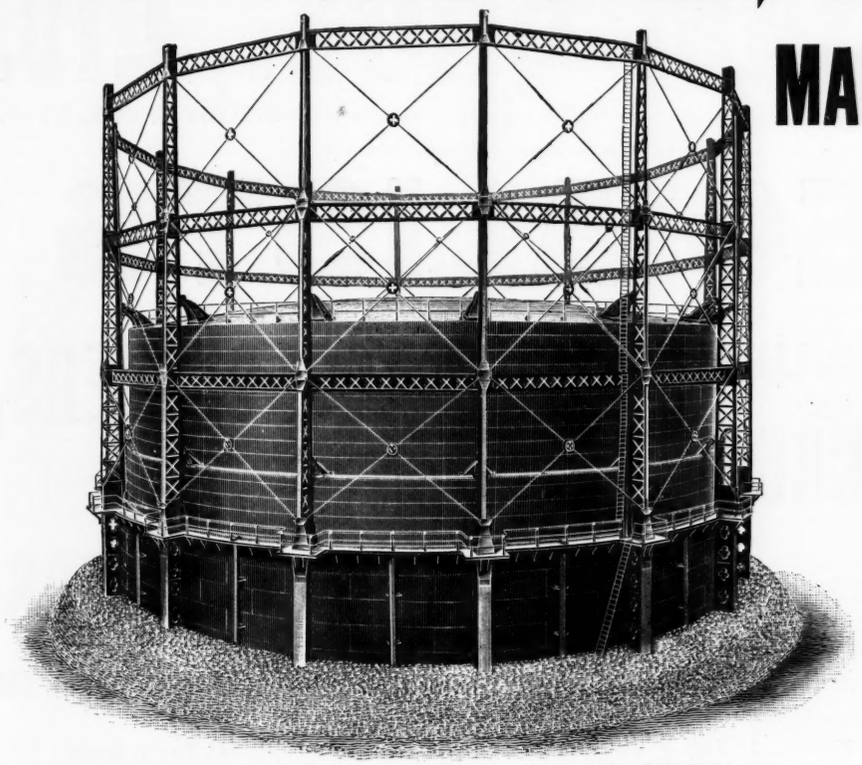
R. & J. DEMPSTER, LTD., GAS PLANT WORKS, MANCHESTER.



Steel Tank, 140 ft. diameter, by 26 ft. 9 in. deep, and 3-Lift Holder Erected by R. & J. D., Ltd., at York, under the Superintendence and to the Designs of Messrs. T. Newbigging and Son, Manchester.

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OF

Gasholders

OF

ALL SIZES, IN

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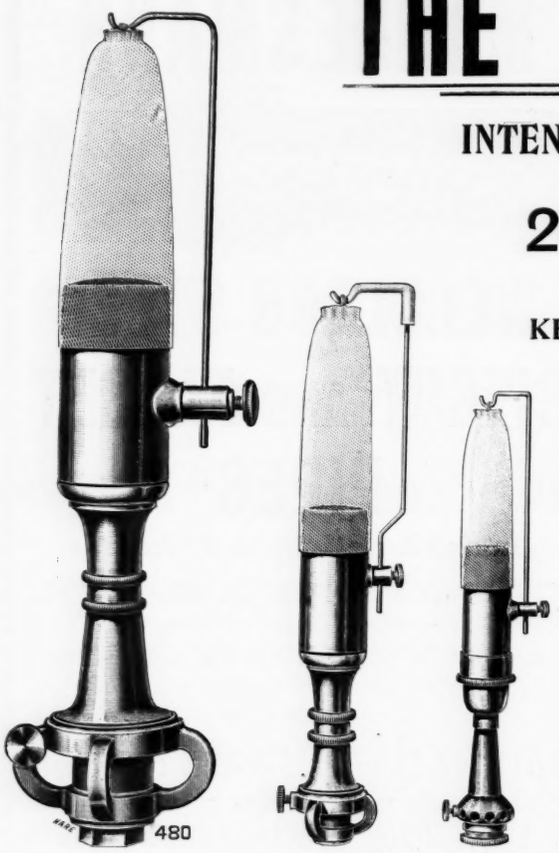

1000 c.p. 300 to 500 c.p. 150 to 250 c.p.

INTENSIFIED INCANDESCENT GAS.

2000 INSTALLATIONS NOW IN USE.

KEITH'S PATENT BURNERS are made in various sizes up to 1000 c.p.

MAINTAINED AT A MINIMUM COST.

Perfect Air-inlet Adjustment.

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